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| (54) Title: HUMAN SECRETORY PROTEINS | | | |
| (57) Abstract The invention provides human secretory proteins (HSECP) and polynucleotides which identify and encode HSECP. The invention also provides expression vectors, host cells, antibodies, agonists, and antagonists. The invention also provides methods for diagnosing, treating, or preventing disorders associated with expression of HSECP. | | | |

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HUMAN SECRETORY PROTEINS

TECHNICAL FIELD

This invention relates to nucleic acid and amino acid sequences of human secretory proteins
5 and to the use of these sequences in the diagnosis, treatment, and prevention of cancer, inflammation, and gastrointestinal, cardiovascular, and neurological disorders.

BACKGROUND OF THE INVENTION

Protein transport and secretion are essential for cellular function. Protein transport is
10 mediated by a signal peptide located at the amino terminus of the protein to be transported or secreted. The signal peptide is comprised of about ten to twenty hydrophobic amino acids which target the nascent protein from the ribosome to a particular membrane bound compartment such as the endoplasmic reticulum (ER). Proteins targeted to the ER may either proceed through the secretory pathway or remain in any of the secretory organelles such as the ER, Golgi apparatus, or lysosomes.
15 Proteins that transit through the secretory pathway are either secreted into the extracellular space or retained in the plasma membrane. Secreted proteins are often synthesized as inactive precursors that are activated by post-translational processing events during transit through the secretory pathway. Such events include glycosylation, proteolysis, and removal of the signal peptide by a signal peptidase. Other events that may occur during protein transport include chaperone-dependent
20 unfolding and folding of the nascent protein and interaction of the protein with a receptor or pore complex. Examples of secreted proteins with amino terminal signal peptides are discussed below and include receptors, extracellular matrix molecules, cytokines, hormones, growth and differentiation factors, neuropeptides, vasomediators, ion channels, transporters/pumps, and proteases. (Reviewed in Alberts, B. et al. (1994) Molecular Biology of The Cell, Garland Publishing, New York, NY, pp. 557-
25 560, 582-592.)

G-protein coupled receptors (GPCRs) comprise a superfamily of integral membrane proteins which transduce extracellular signals. Not all GPCRs contain N-terminal signal peptides. GPCRs include receptors for biogenic amines such as dopamine, epinephrine, histamine, glutamate (metabotropic-type), acetylcholine (muscarinic-type), and serotonin; for lipid mediators of
30 inflammation such as prostaglandins, platelet activating factor, and leukotrienes; for peptide hormones such as calcitonin, C5a anaphylatoxin, follicle stimulating hormone, gonadotropin releasing hormone, neurokinin, oxytocin, and thrombin; and for sensory signal mediators such as retinal photopigments and olfactory stimulatory molecules. The structure of these highly conserved receptors consists of seven hydrophobic transmembrane regions, cysteine disulfide bridges between
35 the second and third extracellular loops, an extracellular N-terminus, and a cytoplasmic C-terminus.

The N-terminus interacts with ligands, the disulfide bridges interact with agonists and antagonists, and the large third intracellular loop interacts with G proteins to activate second messengers such as cyclic AMP, phospholipase C, inositol triphosphate, or ion channels. (Reviewed in Watson, S. and Arkinstall, S. (1994) The G-protein Linked Receptor Facts Book, Academic Press, San Diego, CA, pp. 2-6; and Bolander, F.F. (1994) Molecular Endocrinology, Academic Press, San Diego, CA, pp. 162-176.)

Other types of receptors include cell surface antigens identified on leukocytic cells of the immune system. These antigens have been identified using systematic, monoclonal antibody (mAb)-based "shot gun" techniques. These techniques have resulted in the production of hundreds of mAbs directed against unknown cell surface leukocytic antigens. These antigens have been grouped into "clusters of differentiation" based on common immunocytochemical localization patterns in various differentiated and undifferentiated leukocytic cell types. Antigens in a given cluster are presumed to identify a single cell surface protein and are assigned a "cluster of differentiation" or "CD" designation. Some of the genes encoding proteins identified by CD antigens have been cloned and verified by standard molecular biology techniques. CD antigens have been characterized as both transmembrane proteins and cell surface proteins anchored to the plasma membrane via covalent attachment to fatty acid-containing glycolipids such as glycosylphosphatidylinositol (GPI). (Reviewed in Barclay, A. N. et al. (1995) The Leucocyte Antigen Facts Book, Academic Press, San Diego, CA, pp. 17-20.)

Matrix proteins (MPs) are transmembrane and extracellular proteins which function in formation, growth, remodeling, and maintenance of tissues and as important mediators and regulators of the inflammatory response. The expression and balance of MPs may be perturbed by biochemical changes that result from congenital, epigenetic, or infectious diseases. In addition, MPs affect leukocyte migration, proliferation, differentiation, and activation in the immune response. MPs are frequently characterized by the presence of one or more domains which may include collagen-like domains, EGF-like domains, immunoglobulin-like domains, and fibronectin-like domains. In addition, MPs may be heavily glycosylated and may contain an Arginine-Glycine-Aspartate (RGD) tripeptide motif which may play a role in adhesive interactions. MPs include extracellular proteins such as fibronectin, collagen, galectin, vitronectin and its proteolytic derivative somatomedin B; and cell adhesion receptors such as cell adhesion molecules (CAMs), cadherins, and integrins. (Reviewed in Ayad, S. et al. (1994) The Extracellular Matrix Facts Book, Academic Press, San Diego, CA, pp. 2-16; Ruoslahti, E. (1997) *Kidney Int.* 51:1413-1417; Sjaastad, M.D. and Nelson, W.J. (1997) *BioEssays* 19:47-55.)

Cytokines are secreted by hematopoietic cells in response to injury or infection. Interleukins, neurotrophins, growth factors, interferons, and chemokines all define cytokine families that work in

conjunction with cellular receptors to regulate cell proliferation and differentiation. In addition, cytokines effect activities such as leukocyte migration and function, hematopoietic cell proliferation, temperature regulation, acute response to infection, tissue remodeling, and apoptosis.

Chemokines, in particular, are small chemoattractant cytokines involved in inflammation, leukocyte proliferation and migration, angiogenesis and angiostasis, regulation of hematopoiesis, HIV infectivity, and stimulation of cytokine secretion. Chemokines generally contain 70-100 amino acids and are subdivided into four subfamilies based on the presence of conserved cysteine-based motifs. (Callard, R. and Gearing, A. (1994) The Cytokine Facts Book, Academic Press, New York, NY, pp. 181-190, 210-213, 223-227.)

Growth and differentiation factors are secreted proteins which function in intercellular communication. Some factors require oligomerization or association with MPs for activity. Complex interactions among these factors and their receptors trigger intracellular signal transduction pathways that stimulate or inhibit cell division, cell differentiation, cell signaling, and cell motility. Most growth and differentiation factors act on cells in their local environment (paracrine signaling). There are three broad classes of growth and differentiation factors. The first class includes the large polypeptide growth factors such as epidermal growth factor, fibroblast growth factor, transforming growth factor, insulin-like growth factor, and platelet-derived growth factor. The second class includes the hematopoietic growth factors such as the colony stimulating factors (CSFs). Hematopoietic growth factors stimulate the proliferation and differentiation of blood cells such as B-lymphocytes, T-lymphocytes, erythrocytes, platelets, eosinophils, basophils, neutrophils, macrophages, and their stem cell precursors. The third class includes small peptide factors such as bombesin, vasopressin, oxytocin, endothelin, transferrin, angiotensin II, vasoactive intestinal peptide, and bradykinin which function as hormones to regulate cellular functions other than proliferation.

Growth and differentiation factors play critical roles in neoplastic transformation of cells in vitro and in tumor progression in vivo. Inappropriate expression of growth factors by tumor cells may contribute to vascularization and metastasis of tumors. During hematopoiesis, growth factor misregulation can result in anemias, leukemias, and lymphomas. Certain growth factors such as interferon are cytotoxic to tumor cells both in vivo and in vitro. Moreover, some growth factors and growth factor receptors are related both structurally and functionally to oncoproteins. In addition, growth factors affect transcriptional regulation of both proto-oncogenes and oncosuppressor genes. (Reviewed in Pimentel, E. (1994) Handbook of Growth Factors, CRC Press, Ann Arbor, MI, pp. 1-9.)

Proteolytic enzymes or proteases either activate or deactivate proteins by hydrolyzing peptide bonds. Proteases are found in the cytosol, in membrane-bound compartments, and in the extracellular space. The major families are the zinc, serine, cysteine, thiol, and carboxyl proteases.

Ion channels, ion pumps, and transport proteins mediate the transport of molecules across

cellular membranes. Transport can occur by a passive, concentration-dependent mechanism or can be linked to an energy source such as ATP hydrolysis. Symporters and antiporters transport ions and small molecules such as amino acids, glucose, and drugs. Symporters transport molecules and ions unidirectionally, and antiporters transport molecules and ions bidirectionally. Transporter
5 superfamilies include facilitative transporters and active ATP-binding cassette transporters which are involved in multiple-drug resistance and the targeting of antigenic peptides to MHC Class I molecules. These transporters bind to a specific ion or other molecule and undergo a conformational change in order to transfer the ion or molecule across the membrane. (Reviewed in Alberts, B. et al. (1994) Molecular Biology of The Cell, Garland Publishing, New York, NY, pp. 523-546.)

10 Ion channels are formed by transmembrane proteins which create a lined passageway across the membrane through which water and ions, such as Na^+ , K^+ , Ca^{2+} , and Cl^- , enter and exit the cell. For example, chloride channels are involved in the regulation of the membrane electric potential as well as absorption and secretion of ions across the membrane. Chloride channels also regulate the internal pH of membrane-bound organelles.

15 Ion pumps are ATPases which actively maintain membrane gradients. Ion pumps are classified as P, V, or F according to their structure and function. All have one or more binding sites for ATP in their cytosolic domains. The P-class ion pumps include Ca^{2+} ATPase and Na^+/K^+ ATPase and function in transporting H^+ , Na^+ , K^+ , and Ca^{2+} ions. P-class pumps consist of two α and two β transmembrane subunits. The V- and F-class ion pumps have similar structures but transport only H^+ .
20 F class H^+ pumps mediate transport across the membranes of mitochondria and chloroplasts, while V-class H^+ pumps regulate acidity inside lysosomes, endosomes, and plant vacuoles.

A family of structurally related intrinsic membrane proteins known as facilitative glucose transporters catalyze the movement of glucose and other selected sugars across the plasma membrane. The proteins in this family contain a highly conserved, large transmembrane domain comprised of 12
25 α -helices, and several weakly conserved, cytoplasmic and exoplasmic domains. (Pessin, J. E., and Bell, G.I. (1992) *Annu. Rev. Physiol.* 54:911-930.)

Amino acid transport is mediated by Na^+ dependent amino acid transporters. These transporters are involved in gastrointestinal and renal uptake of dietary and cellular amino acids and in neuronal reuptake of neurotransmitters. Transport of cationic amino acids is mediated by the
30 system y⁺ family and the cationic amino acid transporter (CAT) family. Members of the CAT family share a high degree of sequence homology, and each contains 12-14 putative transmembrane domains. (Ito, K. and Groudine, M. (1997) *J. Biol. Chem.* 272:26780-26786.)

Hormones are secreted molecules that travel through the circulation and bind to specific receptors on the surface of, or within, target cells. Although they have diverse biochemical
35 compositions and mechanisms of action, hormones can be grouped into two categories. One category

includes small lipophilic hormones that diffuse through the plasma membrane of target cells, bind to cytosolic or nuclear receptors, and form a complex that alters gene expression. Examples of these molecules include retinoic acid, thyroxine, and the cholesterol-derived steroid hormones such as progesterone, estrogen, testosterone, cortisol, and aldosterone. The second category includes

5 hydrophilic hormones that function by binding to cell surface receptors that transduce signals across the plasma membrane. Examples of such hormones include amino acid derivatives such as catecholamines and peptide hormones such as glucagon, insulin, gastrin, secretin, cholecystokinin, adrenocorticotrophic hormone, follicle stimulating hormone, luteinizing hormone, thyroid stimulating hormone, and vasopressin. (See, for example, Lodish et al. (1995) Molecular Cell Biology, Scientific
10 American Books Inc., New York, NY, pp. 856-864.)

Neuropeptides and vasomediators (NP/VM) comprise a large family of endogenous signaling molecules. Included in this family are neuropeptides and neuropeptide hormones such as bombesin, neuropeptide Y, neurotensin, neuromedin N, melanocortins, opioids, galanin, somatostatin, tachykinins, urotensin II and related peptides involved in smooth muscle stimulation, vasopressin,
15 vasoactive intestinal peptide, and circulatory system-borne signaling molecules such as angiotensin, complement, calcitonin, endothelins, formyl-methionyl peptides, glucagon, cholecystokinin and gastrin. NP/VMs can transduce signals directly, modulate the activity or release of other neurotransmitters and hormones, and act as catalytic enzymes in cascades. The effects of NP/VMs range from extremely brief to long-lasting. (Reviewed in Martin, C. R. et al. (1985) Endocrine
20 Physiology, Oxford University Press, New York, NY, pp. 57-62.)

The discovery of new human secretory proteins and the polynucleotides encoding them satisfies a need in the art by providing new compositions which are useful in the diagnosis, prevention, and treatment of cancer, inflammation, and gastrointestinal, cardiovascular, and neurological disorders.

25

SUMMARY OF THE INVENTION

The invention features purified polypeptides, human secretory proteins, referred to collectively as "HSECP" and individually as "HSECP-1," "HSECP-2," "HSECP-3," "HSECP-4," "HSECP-5," "HSECP-6," "HSECP-7," "HSECP-8," "HSECP-9," "HSECP-10," "HSECP-11,"
30 "HSECP-12," "HSECP-13," "HSECP-14," "HSECP-15," "HSECP-16," "HSECP-17," "HSECP-18," "HSECP-19," "HSECP-20," "HSECP-21" and "HSECP-22." In one aspect, the invention provides an isolated polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, c) a biologically active
35 fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an

immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22. In one alternative, the invention provides an isolated polypeptide comprising the amino acid sequence of SEQ ID NO:1-22.

The invention further provides an isolated polynucleotide encoding a polypeptide comprising

- 5 a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22. In one
10 alternative, the polynucleotide is selected from the group consisting of SEQ ID NO:23-44.

Additionally, the invention provides a recombinant polynucleotide comprising a promoter sequence operably linked to a polynucleotide encoding a polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group
15 consisting of SEQ ID NO:1-22, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22. In one alternative, the invention provides a cell transformed with the recombinant polynucleotide. In another alternative, the invention provides a transgenic organism comprising the recombinant polynucleotide.

- 20 The invention also provides a method for producing a polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino
25 acid sequence selected from the group consisting of SEQ ID NO:1-22. The method comprises a) culturing a cell under conditions suitable for expression of the polypeptide, wherein said cell is transformed with a recombinant polynucleotide comprising a promoter sequence operably linked to a polynucleotide encoding the polypeptide, and b) recovering the polypeptide so expressed.

Additionally, the invention provides an isolated antibody which specifically binds to a

- 30 polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID
35 NO:1-22.

The invention further provides an isolated polynucleotide comprising a) a polynucleotide sequence selected from the group consisting of SEQ ID NO:23-44, b) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:23-44, c) a polynucleotide sequence complementary to a), or d) a polynucleotide sequence complementary to b). In one alternative, the polynucleotide comprises at least 60 contiguous nucleotides.

Additionally, the invention provides a method for detecting a target polynucleotide in a sample, said target polynucleotide having a sequence of a polynucleotide comprising a) a polynucleotide sequence selected from the group consisting of SEQ ID NO:23-44, b) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:23-44, c) a polynucleotide sequence complementary to a), or d) a polynucleotide sequence complementary to b). The method comprises a) hybridizing the sample with a probe comprising at least 16 contiguous nucleotides comprising a sequence complementary to said target polynucleotide in the sample, and which probe specifically hybridizes to said target polynucleotide, under conditions whereby a hybridization complex is formed between said probe and said target polynucleotide, and b) detecting the presence or absence of said hybridization complex, and optionally, if present, the amount thereof. In one alternative, the probe comprises at least 30 contiguous nucleotides. In another alternative, the probe comprises at least 60 contiguous nucleotides.

The invention further provides a pharmaceutical composition comprising an effective amount of a polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, and a pharmaceutically acceptable excipient. The invention additionally provides a method of treating a disease or condition associated with decreased expression of functional HSECP, comprising administering to a patient in need of such treatment the pharmaceutical composition.

The invention also provides a method for screening a compound for effectiveness as an agonist of a polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22. The method comprises a) exposing a sample comprising the polypeptide to a

compound, and b) detecting agonist activity in the sample. In one alternative, the invention provides a pharmaceutical composition comprising an agonist compound identified by the method and a pharmaceutically acceptable excipient. In another alternative, the invention provides a method of treating a disease or condition associated with decreased expression of functional HSECP,

5 comprising administering to a patient in need of such treatment the pharmaceutical composition.

Additionally, the invention provides a method for screening a compound for effectiveness as an antagonist of a polypeptide comprising a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22,
10 c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, or d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22. The method comprises a) exposing a sample comprising the polypeptide to a compound, and b) detecting antagonist activity in the sample. In one alternative, the invention provides a pharmaceutical composition comprising an antagonist compound identified by
15 the method and a pharmaceutically acceptable excipient. In another alternative, the invention provides a method of treating a disease or condition associated with overexpression of functional HSECP, comprising administering to a patient in need of such treatment the pharmaceutical composition.

The invention further provides a method for screening a compound for effectiveness in
20 altering expression of a target polynucleotide, wherein said target polynucleotide comprises a sequence selected from the group consisting of SEQ ID NO:23-44, the method comprising a) exposing a sample comprising the target polynucleotide to a compound, and b) detecting altered expression of the target polynucleotide.

25 BRIEF DESCRIPTION OF THE TABLES

Table 1 shows polypeptide and nucleotide sequence identification numbers (SEQ ID NOs), clone identification numbers (clone IDs), cDNA libraries, and cDNA fragments used to assemble full-length sequences encoding HSECP.

Table 2 shows features of each polypeptide sequence, including predicted signal peptides and
30 other motifs, and methods, algorithms, and searchable databases used for analysis of HSECP.

Table 3 shows selected fragments of each nucleic acid sequence; the tissue-specific expression patterns of each nucleic acid sequence as determined by northern analysis; diseases, disorders, or conditions associated with these tissues; and the vector into which each cDNA was cloned.

35 Table 4 describes the tissues used to construct the cDNA libraries from which cDNA clones

encoding HSECP were isolated.

Table 5 shows the tools, programs, and algorithms used to analyze HSECP, along with applicable descriptions, references, and threshold parameters.

DESCRIPTION OF THE INVENTION

Before the present proteins, nucleotide sequences, and methods are described, it is understood that this invention is not limited to the particular machines, materials and methods described, as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention which will be limited only by the appended claims.

It must be noted that as used herein and in the appended claims, the singular forms "a," "an," and "the" include plural reference unless the context clearly dictates otherwise. Thus, for example, a reference to "a host cell" includes a plurality of such host cells, and a reference to "an antibody" is a reference to one or more antibodies and equivalents thereof known to those skilled in the art, and so forth.

Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any machines, materials, and methods similar or equivalent to those described herein can be used to practice or test the present invention, the preferred machines, materials and methods are now described. All publications mentioned herein are cited for the purpose of describing and disclosing the cell lines, protocols, reagents and vectors which are reported in the publications and which might be used in connection with the invention. Nothing herein is to be construed as an admission that the invention is not entitled to antedate such disclosure by virtue of prior invention.

DEFINITIONS

"HSECP" refers to the amino acid sequences of substantially purified HSECP obtained from any species, particularly a mammalian species, including bovine, ovine, porcine, murine, equine, and human, and from any source, whether natural, synthetic, semi-synthetic, or recombinant.

The term "agonist" refers to a molecule which intensifies or mimics the biological activity of HSECP. Agonists may include proteins, nucleic acids, carbohydrates, small molecules, or any other compound or composition which modulates the activity of HSECP either by directly interacting with HSECP or by acting on components of the biological pathway in which HSECP participates.

An "allelic variant" is an alternative form of the gene encoding HSECP. Allelic variants may result from at least one mutation in the nucleic acid sequence and may result in altered mRNAs or polypeptides whose structure or function may or may not be altered. A gene may have none, one, or many allelic variants of its naturally occurring form. Common mutational changes which give rise to

allelic variants are generally ascribed to natural deletions, additions, or substitutions of nucleotides. Each of these types of changes may occur alone, or in combination with the others, one or more times in a given sequence.

“Altered” nucleic acid sequences encoding HSECP include those sequences with deletions, insertions, or substitutions of different nucleotides, resulting in a polypeptide the same as HSECP or a polypeptide with at least one functional characteristic of HSECP. Included within this definition are polymorphisms which may or may not be readily detectable using a particular oligonucleotide probe of the polynucleotide encoding HSECP, and improper or unexpected hybridization to allelic variants, with a locus other than the normal chromosomal locus for the polynucleotide sequence encoding HSECP. The encoded protein may also be “altered,” and may contain deletions, insertions, or substitutions of amino acid residues which produce a silent change and result in a functionally equivalent HSECP. Deliberate amino acid substitutions may be made on the basis of similarity in polarity, charge, solubility, hydrophobicity, hydrophilicity, and/or the amphipathic nature of the residues, as long as the biological or immunological activity of HSECP is retained. For example, negatively charged amino acids may include aspartic acid and glutamic acid, and positively charged amino acids may include lysine and arginine. Amino acids with uncharged polar side chains having similar hydrophilicity values may include: asparagine and glutamine; and serine and threonine. Amino acids with uncharged side chains having similar hydrophilicity values may include: leucine, isoleucine, and valine; glycine and alanine; and phenylalanine and tyrosine.

The terms “amino acid” and “amino acid sequence” refer to an oligopeptide, peptide, polypeptide, or protein sequence, or a fragment of any of these, and to naturally occurring or synthetic molecules. Where “amino acid sequence” is recited to refer to an amino acid sequence of a naturally occurring protein molecule, “amino acid sequence” and like terms are not meant to limit the amino acid sequence to the complete native amino acid sequence associated with the recited protein molecule.

“Amplification” relates to the production of additional copies of a nucleic acid sequence. Amplification is generally carried out using polymerase chain reaction (PCR) technologies well known in the art.

The term “antagonist” refers to a molecule which inhibits or attenuates the biological activity of HSECP. Antagonists may include proteins such as antibodies, nucleic acids, carbohydrates, small molecules, or any other compound or composition which modulates the activity of HSECP either by directly interacting with HSECP or by acting on components of the biological pathway in which HSECP participates.

The term “antibody” refers to intact immunoglobulin molecules as well as to fragments thereof, such as Fab, F(ab')₂, and Fv fragments, which are capable of binding an epitopic determinant.

Antibodies that bind HSECP polypeptides can be prepared using intact polypeptides or using fragments containing small peptides of interest as the immunizing antigen. The polypeptide or oligopeptide used to immunize an animal (e.g., a mouse, a rat, or a rabbit) can be derived from the translation of RNA, or synthesized chemically, and can be conjugated to a carrier protein if desired.

- 5 Commonly used carriers that are chemically coupled to peptides include bovine serum albumin, thyroglobulin, and keyhole limpet hemocyanin (KLH). The coupled peptide is then used to immunize the animal.

The term "antigenic determinant" refers to that region of a molecule (i.e., an epitope) that makes contact with a particular antibody. When a protein or a fragment of a protein is used to
10 immunize a host animal, numerous regions of the protein may induce the production of antibodies which bind specifically to antigenic determinants (particular regions or three-dimensional structures on the protein). An antigenic determinant may compete with the intact antigen (i.e., the immunogen used to elicit the immune response) for binding to an antibody.

The term "antisense" refers to any composition capable of base-pairing with the "sense"
15 strand of a specific nucleic acid sequence. Antisense compositions may include DNA; RNA; peptide nucleic acid (PNA); oligonucleotides having modified backbone linkages such as phosphorothioates, methylphosphonates, or benzylphosphonates; oligonucleotides having modified sugar groups such as 2'-methoxyethyl sugars or 2'-methoxyethoxy sugars; or oligonucleotides having modified bases such as 5-methyl cytosine, 2'-deoxyuracil, or 7-deaza-2'-deoxyguanosine. Antisense molecules may be
20 produced by any method including chemical synthesis or transcription. Once introduced into a cell, the complementary antisense molecule base-pairs with a naturally occurring nucleic acid sequence produced by the cell to form duplexes which block either transcription or translation. The designation "negative" or "minus" can refer to the antisense strand, and the designation "positive" or "plus" can refer to the sense strand of a reference DNA molecule.

25 The term "biologically active" refers to a protein having structural, regulatory, or biochemical functions of a naturally occurring molecule. Likewise, "immunologically active" refers to the capability of the natural, recombinant, or synthetic HSECP, or of any oligopeptide thereof, to induce a specific immune response in appropriate animals or cells and to bind with specific antibodies.

The terms "complementary" and "complementarity" refer to the natural binding of
30 polynucleotides by base pairing. For example, the sequence "5' A-G-T 3'" bonds to the complementary sequence "3' T-C-A 5'." Complementarity between two single-stranded molecules may be "partial," such that only some of the nucleic acids bind, or it may be "complete," such that total complementarity exists between the single stranded molecules. The degree of complementarity between nucleic acid strands has significant effects on the efficiency and strength of the hybridization
35 between the nucleic acid strands. This is of particular importance in amplification reactions, which

depend upon binding between nucleic acid strands, and in the design and use of peptide nucleic acid (PNA) molecules.

A "composition comprising a given polynucleotide sequence" and a "composition comprising a given amino acid sequence" refer broadly to any composition containing the given polynucleotide or amino acid sequence. The composition may comprise a dry formulation or an aqueous solution. Compositions comprising polynucleotide sequences encoding HSECP or fragments of HSECP may be employed as hybridization probes. The probes may be stored in freeze-dried form and may be associated with a stabilizing agent such as a carbohydrate. In hybridizations, the probe may be deployed in an aqueous solution containing salts (e.g., NaCl), detergents (e.g., sodium dodecyl sulfate; SDS), and other components (e.g., Denhardt's solution, dry milk, salmon sperm DNA, etc.).

"Consensus sequence" refers to a nucleic acid sequence which has been resequenced to resolve uncalled bases, extended using the XL-PCR kit (Perkin-Elmer, Norwalk CT) in the 5' and/or the 3' direction, and resequenced, or which has been assembled from the overlapping sequences of one or more Incyte Clones and, in some cases, one or more public domain ESTs, using a computer program for fragment assembly, such as the GELVIEW fragment assembly system (GCG, Madison WI). Some sequences have been both extended and assembled to produce the consensus sequence.

"Conservative amino acid substitutions" are those substitutions that, when made, least interfere with the properties of the original protein, i.e., the structure and especially the function of the protein is conserved and not significantly changed by such substitutions. The table below shows amino acids which may be substituted for an original amino acid in a protein and which are regarded as conservative amino acid substitutions.

| | Original Residue | Conservative Substitution |
|----|------------------|---------------------------|
| | Ala | Gly, Ser |
| | Arg | His, Lys |
| 25 | Asn | Asp, Gln, His |
| | Asp | Asn, Glu |
| | Cys | Ala, Ser |
| | Gln | Asn, Glu, His |
| | Glu | Asp, Gln, His |
| 30 | Gly | Ala |
| | His | Asn, Arg, Gln, Glu |
| | Ile | Leu, Val |
| | Leu | Ile, Val |
| | Lys | Arg, Gln, Glu |
| 35 | Met | Leu, Ile |
| | Phe | His, Met, Leu, Trp, Tyr |
| | Ser | Cys, Thr |
| | Thr | Ser, Val |
| | Trp | Phe, Tyr |
| 40 | Tyr | His, Phe, Trp |
| | Val | Ile, Leu, Thr |

Conservative amino acid substitutions generally maintain (a) the structure of the polypeptide backbone in the area of the substitution, for example, as a beta sheet or alpha helical conformation, (b) the charge or hydrophobicity of the molecule at the site of the substitution, and/or (c) the bulk of the side chain.

5 A "deletion" refers to a change in the amino acid or nucleotide sequence that results in the absence of one or more amino acid residues or nucleotides.

The term "derivative" refers to the chemical modification of a polypeptide sequence, or a polynucleotide sequence. Chemical modifications of a polynucleotide sequence can include, for example, replacement of hydrogen by an alkyl, acyl, hydroxyl, or amino group. A derivative
10 polynucleotide encodes a polypeptide which retains at least one biological or immunological function of the natural molecule. A derivative polypeptide is one modified by glycosylation, pegylation, or any similar process that retains at least one biological or immunological function of the polypeptide from which it was derived.

A "fragment" is a unique portion of HSECP or the polynucleotide encoding HSECP which is
15 identical in sequence to but shorter in length than the parent sequence. A fragment may comprise up to the entire length of the defined sequence, minus one nucleotide/amino acid residue. For example, a fragment may comprise from 5 to 1000 contiguous nucleotides or amino acid residues. A fragment used as a probe, primer, antigen, therapeutic molecule, or for other purposes, may be at least 5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100, 150, 250 or at least 500 contiguous nucleotides or amino acid
20 residues in length. Fragments may be preferentially selected from certain regions of a molecule. For example, a polypeptide fragment may comprise a certain length of contiguous amino acids selected from the first 250 or 500 amino acids (or first 25% or 50% of a polypeptide) as shown in a certain defined sequence. Clearly these lengths are exemplary, and any length that is supported by the specification, including the Sequence Listing, tables, and figures, may be encompassed by the present
25 embodiments.

A fragment of SEQ ID NO:23-44 comprises a region of unique polynucleotide sequence that specifically identifies SEQ ID NO:23-44, for example, as distinct from any other sequence in the same genome. A fragment of SEQ ID NO:23-44 is useful, for example, in hybridization and amplification technologies and in analogous methods that distinguish SEQ ID NO:23-44 from related
30 polynucleotide sequences. The precise length of a fragment of SEQ ID NO:23-44 and the region of SEQ ID NO:23-44 to which the fragment corresponds are routinely determinable by one of ordinary skill in the art based on the intended purpose for the fragment.

A fragment of SEQ ID NO:1-22 is encoded by a fragment of SEQ ID NO:23-44. A fragment of SEQ ID NO:1-22 comprises a region of unique amino acid sequence that specifically identifies
35 SEQ ID NO:1-22. For example, a fragment of SEQ ID NO:1-22 is useful as an immunogenic peptide

for the development of antibodies that specifically recognize SEQ ID NO:1-22. The precise length of a fragment of SEQ ID NO:1-22 and the region of SEQ ID NO:1-22 to which the fragment corresponds are routinely determinable by one of ordinary skill in the art based on the intended purpose for the fragment.

5 The term "similarity" refers to a degree of complementarity. There may be partial similarity or complete similarity. The word "identity" may substitute for the word "similarity." A partially complementary sequence that at least partially inhibits an identical sequence from hybridizing to a target nucleic acid is referred to as "substantially similar." The inhibition of hybridization of the completely complementary sequence to the target sequence may be examined using a hybridization
10 assay (Southern or northern blot, solution hybridization, and the like) under conditions of reduced stringency. A substantially similar sequence or hybridization probe will compete for and inhibit the binding of a completely similar (identical) sequence to the target sequence under conditions of reduced stringency. This is not to say that conditions of reduced stringency are such that non-specific binding is permitted, as reduced stringency conditions require that the binding of two sequences to
15 one another be a specific (i.e., a selective) interaction. The absence of non-specific binding may be tested by the use of a second target sequence which lacks even a partial degree of complementarity (e.g., less than about 30% similarity or identity). In the absence of non-specific binding, the substantially similar sequence or probe will not hybridize to the second non-complementary target sequence.

20 The phrases "percent identity" and "% identity," as applied to polynucleotide sequences, refer to the percentage of residue matches between at least two polynucleotide sequences aligned using a standardized algorithm. Such an algorithm may insert, in a standardized and reproducible way, gaps in the sequences being compared in order to optimize alignment between two sequences, and therefore achieve a more meaningful comparison of the two sequences.

25 Percent identity between polynucleotide sequences may be determined using the default parameters of the CLUSTAL V algorithm as incorporated into the MEGALIGN version 3.12e sequence alignment program. This program is part of the LASERGENE software package, a suite of molecular biological analysis programs (DNASTAR, Madison WI). CLUSTAL V is described in Higgins, D.G. and P.M. Sharp (1989) CABIOS 5:151-153 and in Higgins, D.G. et al. (1992) CABIOS
30 8:189-191. For pairwise alignments of polynucleotide sequences, the default parameters are set as follows: Ktuple=2, gap penalty=5, window=4, and "diagonals saved"=4. The "weighted" residue weight table is selected as the default. Percent identity is reported by CLUSTAL V as the "percent similarity" between aligned polynucleotide sequence pairs.

 Alternatively, a suite of commonly used and freely available sequence comparison algorithms
35 is provided by the National Center for Biotechnology Information (NCBI) Basic Local Alignment

Search Tool (BLAST) (Altschul, S.F. et al. (1990) J. Mol. Biol. 215:403-410), which is available from several sources, including the NCBI, Bethesda, MD, and on the Internet at

<http://www.ncbi.nlm.nih.gov/BLAST/>. The BLAST software suite includes various sequence analysis programs including "blastn," that is used to align a known polynucleotide sequence with

5 other polynucleotide sequences from a variety of databases. Also available is a tool called "BLAST 2 Sequences" that is used for direct pairwise comparison of two nucleotide sequences. "BLAST 2 Sequences" can be accessed and used interactively at <http://www.ncbi.nlm.nih.gov/gorf/bl2.html>.

The "BLAST 2 Sequences" tool can be used for both blastn and blastp (discussed below). BLAST programs are commonly used with gap and other parameters set to default settings. For example, to
10 compare two nucleotide sequences, one may use blastn with the "BLAST 2 Sequences" tool Version 2.0.9 (May-07-1999) set at default parameters. Such default parameters may be, for example:

Matrix: BLOSUM62

Reward for match: 1

Penalty for mismatch: -2

15 *Open Gap: 5 and Extension Gap: 2 penalties*

Gap x drop-off: 50

Expect: 10

Word Size: 11

Filter: on

20 Percent identity may be measured over the length of an entire defined sequence, for example, as defined by a particular SEQ ID number, or may be measured over a shorter length, for example, over the length of a fragment taken from a larger, defined sequence, for instance, a fragment of at least 20, at least 30, at least 40, at least 50, at least 70, at least 100, or at least 200 contiguous nucleotides. Such lengths are exemplary only, and it is understood that any fragment length
25 supported by the sequences shown herein, in the tables, figures, or Sequence Listing, may be used to describe a length over which percentage identity may be measured.

Nucleic acid sequences that do not show a high degree of identity may nevertheless encode similar amino acid sequences due to the degeneracy of the genetic code. It is understood that changes in a nucleic acid sequence can be made using this degeneracy to produce multiple nucleic acid
30 sequences that all encode substantially the same protein.

The phrases "percent identity" and "% identity," as applied to polypeptide sequences, refer to the percentage of residue matches between at least two polypeptide sequences aligned using a standardized algorithm. Methods of polypeptide sequence alignment are well-known. Some alignment methods take into account conservative amino acid substitutions. Such conservative
35 substitutions, explained in more detail above, generally preserve the hydrophobicity and acidity at the

site of substitution, thus preserving the structure (and therefore function) of the polypeptide.

Percent identity between polypeptide sequences may be determined using the default parameters of the CLUSTAL V algorithm as incorporated into the MEGALIGN version 3.12e sequence alignment program (described and referenced above). For pairwise alignments of polypeptide sequences using CLUSTAL V, the default parameters are set as follows: Ktuple=1, gap penalty=3, window=5, and "diagonals saved"=5. The PAM250 matrix is selected as the default residue weight table. As with polynucleotide alignments, the percent identity is reported by CLUSTAL V as the "percent similarity" between aligned polypeptide sequence pairs.

Alternatively the NCBI BLAST software suite may be used. For example, for a pairwise comparison of two polypeptide sequences, one may use the "BLAST 2 Sequences" tool Version 2.0.9 (May-07-1999) with blastp set at default parameters. Such default parameters may be, for example:

Matrix: BLOSUM62

Open Gap: 11 and Extension Gap: 1 penalties

Gap x drop-off: 50

Expect: 10

Word Size: 3

Filter: on

Percent identity may be measured over the length of an entire defined polypeptide sequence, for example, as defined by a particular SEQ ID number, or may be measured over a shorter length, for example, over the length of a fragment taken from a larger, defined polypeptide sequence, for instance, a fragment of at least 15, at least 20, at least 30, at least 40, at least 50, at least 70 or at least 150 contiguous residues. Such lengths are exemplary only, and it is understood that any fragment length supported by the sequences shown herein, in the tables, figures or Sequence Listing, may be used to describe a length over which percentage identity may be measured.

"Human artificial chromosomes" (HACs) are linear microchromosomes which may contain DNA sequences of about 6 kb to 10 Mb in size, and which contain all of the elements required for stable mitotic chromosome segregation and maintenance.

The term "humanized antibody" refers to antibody molecules in which the amino acid sequence in the non-antigen binding regions has been altered so that the antibody more closely resembles a human antibody, and still retains its original binding ability.

"Hybridization" refers to the process by which a polynucleotide strand anneals with a complementary strand through base pairing under defined hybridization conditions. Specific hybridization is an indication that two nucleic acid sequences share a high degree of identity. Specific hybridization complexes form under permissive annealing conditions and remain hybridized after the "washing" step(s). The washing step(s) is particularly important in determining the

stringency of the hybridization process, with more stringent conditions allowing less non-specific binding, i.e., binding between pairs of nucleic acid strands that are not perfectly matched. Permissive conditions for annealing of nucleic acid sequences are routinely determinable by one of ordinary skill in the art and may be consistent among hybridization experiments, whereas wash conditions may be varied among experiments to achieve the desired stringency, and therefore hybridization specificity. Permissive annealing conditions occur, for example, at 68°C in the presence of about 6 x SSC, about 1% (w/v) SDS, and about 100 µg/ml denatured salmon sperm DNA.

Generally, stringency of hybridization is expressed, in part, with reference to the temperature under which the wash step is carried out. Generally, such wash temperatures are selected to be about 5°C to 20°C lower than the thermal melting point (T_m) for the specific sequence at a defined ionic strength and pH. The T_m is the temperature (under defined ionic strength and pH) at which 50% of the target sequence hybridizes to a perfectly matched probe. An equation for calculating T_m and conditions for nucleic acid hybridization are well known and can be found in Sambrook et al., 1989, Molecular Cloning: A Laboratory Manual, 2nd ed., vol. 1-3, Cold Spring Harbor Press, Plainview NY; specifically see volume 2, chapter 9.

High stringency conditions for hybridization between polynucleotides of the present invention include wash conditions of 68°C in the presence of about 0.2 x SSC and about 0.1% SDS, for 1 hour. Alternatively, temperatures of about 65°C, 60°C, 55°C, or 42°C may be used. SSC concentration may be varied from about 0.1 to 2 x SSC, with SDS being present at about 0.1%.

Typically, blocking reagents are used to block non-specific hybridization. Such blocking reagents include, for instance, denatured salmon sperm DNA at about 100-200 µg/ml. Organic solvent, such as formamide at a concentration of about 35-50% v/v, may also be used under particular circumstances, such as for RNA:DNA hybridizations. Useful variations on these wash conditions will be readily apparent to those of ordinary skill in the art. Hybridization, particularly under high stringency conditions, may be suggestive of evolutionary similarity between the nucleotides. Such similarity is strongly indicative of a similar role for the nucleotides and their encoded polypeptides.

The term "hybridization complex" refers to a complex formed between two nucleic acid sequences by virtue of the formation of hydrogen bonds between complementary bases. A hybridization complex may be formed in solution (e.g., C_0t or R_0t analysis) or formed between one nucleic acid sequence present in solution and another nucleic acid sequence immobilized on a solid support (e.g., paper, membranes, filters, chips, pins or glass slides, or any other appropriate substrate to which cells or their nucleic acids have been fixed).

The words "insertion" and "addition" refer to changes in an amino acid or nucleotide sequence resulting in the addition of one or more amino acid residues or nucleotides, respectively.

"Immune response" can refer to conditions associated with inflammation, trauma, immune

disorders, or infectious or genetic disease, etc. These conditions can be characterized by expression of various factors, e.g., cytokines, chemokines, and other signaling molecules, which may affect cellular and systemic defense systems.

An "immunogenic fragment" is a polypeptide or oligopeptide fragment of HSECP which is capable of eliciting an immune response when introduced into a living organism, for example, a mammal. The term "immunogenic fragment" also includes any polypeptide or oligopeptide fragment of HSECP which is useful in any of the antibody production methods disclosed herein or known in the art.

The term "microarray" refers to an arrangement of distinct polynucleotides on a substrate.

The terms "element" and "array element" in a microarray context, refer to hybridizable polynucleotides arranged on the surface of a substrate.

The term "modulate" refers to a change in the activity of HSECP. For example, modulation may cause an increase or a decrease in protein activity, binding characteristics, or any other biological, functional, or immunological properties of HSECP.

The phrases "nucleic acid" or "nucleic acid sequence," as used herein, refer to a nucleotide, oligonucleotide, polynucleotide, or any fragment thereof. These phrases also refer to DNA or RNA of genomic or synthetic origin which may be single-stranded or double-stranded and may represent the sense or the antisense strand, to peptide nucleic acid (PNA), or to any DNA-like or RNA-like material.

"Operably linked" refers to the situation in which a first nucleic acid sequence is placed in a functional relationship with the second nucleic acid sequence. For instance, a promoter is operably linked to a coding sequence if the promoter affects the transcription or expression of the coding sequence. Generally, operably linked DNA sequences may be in close proximity or contiguous and, where necessary to join two protein coding regions, in the same reading frame.

"Peptide nucleic acid" (PNA) refers to an antisense molecule or anti-gene agent which comprises an oligonucleotide of at least about 5 nucleotides in length linked to a peptide backbone of amino acid residues ending in lysine. The terminal lysine confers solubility to the composition. PNAs preferentially bind complementary single stranded DNA or RNA and stop transcript elongation, and may be pegylated to extend their lifespan in the cell.

"Probe" refers to nucleic acid sequences encoding HSECP, their complements, or fragments thereof, which are used to detect identical, allelic or related nucleic acid sequences. Probes are isolated oligonucleotides or polynucleotides attached to a detectable label or reporter molecule. Typical labels include radioactive isotopes, ligands, chemiluminescent agents, and enzymes.

"Primers" are short nucleic acids, usually DNA oligonucleotides, which may be annealed to a target polynucleotide by complementary base-pairing. The primer may then be extended along the target

DNA strand by a DNA polymerase enzyme. Primer pairs can be used for amplification (and identification) of a nucleic acid sequence, e.g., by the polymerase chain reaction (PCR).

Probes and primers as used in the present invention typically comprise at least 15 contiguous nucleotides of a known sequence. In order to enhance specificity, longer probes and primers may also be employed, such as probes and primers that comprise at least 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, or at least 150 consecutive nucleotides of the disclosed nucleic acid sequences. Probes and primers may be considerably longer than these examples, and it is understood that any length supported by the specification, including the tables, figures, and Sequence Listing, may be used.

Methods for preparing and using probes and primers are described in the references, for example Sambrook et al., 1989, Molecular Cloning: A Laboratory Manual, 2nd ed., vol. 1-3, Cold Spring Harbor Press, Plainview NY; Ausubel et al., 1987, Current Protocols in Molecular Biology, Greene Publ. Assoc. & Wiley-Intersciences, New York NY; Innis et al., 1990, PCR Protocols, A Guide to Methods and Applications, Academic Press, San Diego CA. PCR primer pairs can be derived from a known sequence, for example, by using computer programs intended for that purpose such as Primer (Version 0.5, 1991, Whitehead Institute for Biomedical Research, Cambridge MA).

Oligonucleotides for use as primers are selected using software known in the art for such purpose. For example, OLIGO 4.06 software is useful for the selection of PCR primer pairs of up to 100 nucleotides each, and for the analysis of oligonucleotides and larger polynucleotides of up to 5,000 nucleotides from an input polynucleotide sequence of up to 32 kilobases. Similar primer selection programs have incorporated additional features for expanded capabilities. For example, the PrimOU primer selection program (available to the public from the Genome Center at University of Texas South West Medical Center, Dallas TX) is capable of choosing specific primers from megabase sequences and is thus useful for designing primers on a genome-wide scope. The Primer3 primer selection program (available to the public from the Whitehead Institute/MIT Center for Genome Research, Cambridge MA) allows the user to input a "mispriming library," in which sequences to avoid as primer binding sites are user-specified. Primer3 is useful, in particular, for the selection of oligonucleotides for microarrays. (The source code for the latter two primer selection programs may also be obtained from their respective sources and modified to meet the user's specific needs.) The PrimeGen program (available to the public from the UK Human Genome Mapping Project Resource Centre, Cambridge UK) designs primers based on multiple sequence alignments, thereby allowing selection of primers that hybridize to either the most conserved or least conserved regions of aligned nucleic acid sequences. Hence, this program is useful for identification of both unique and conserved oligonucleotides and polynucleotide fragments. The oligonucleotides and polynucleotide fragments identified by any of the above selection methods are useful in hybridization technologies, for example, as PCR or sequencing primers, microarray elements, or specific probes to

identify fully or partially complementary polynucleotides in a sample of nucleic acids. Methods of oligonucleotide selection are not limited to those described above.

A "recombinant nucleic acid" is a sequence that is not naturally occurring or has a sequence that is made by an artificial combination of two or more otherwise separated segments of sequence.

- 5 This artificial combination is often accomplished by chemical synthesis or, more commonly, by the artificial manipulation of isolated segments of nucleic acids, e.g., by genetic engineering techniques such as those described in Sambrook, supra. The term recombinant includes nucleic acids that have been altered solely by addition, substitution, or deletion of a portion of the nucleic acid. Frequently, a recombinant nucleic acid may include a nucleic acid sequence operably linked to a promoter
- 10 sequence. Such a recombinant nucleic acid may be part of a vector that is used, for example, to transform a cell.

Alternatively, such recombinant nucleic acids may be part of a viral vector, e.g., based on a vaccinia virus, that could be used to vaccinate a mammal wherein the recombinant nucleic acid is expressed, inducing a protective immunological response in the mammal.

- 15 An "RNA equivalent," in reference to a DNA sequence, is composed of the same linear sequence of nucleotides as the reference DNA sequence with the exception that all occurrences of the nitrogenous base thymine are replaced with uracil, and the sugar backbone is composed of ribose instead of deoxyribose.

- The term "sample" is used in its broadest sense. A sample suspected of containing nucleic acids encoding HSECP, or fragments thereof, or HSECP itself, may comprise a bodily fluid; an extract from a cell, chromosome, organelle, or membrane isolated from a cell; a cell; genomic DNA, RNA, or cDNA, in solution or bound to a substrate; a tissue; a tissue print; etc.
- 20

- The terms "specific binding" and "specifically binding" refer to that interaction between a protein or peptide and an agonist, an antibody, an antagonist, a small molecule, or any natural or synthetic binding composition. The interaction is dependent upon the presence of a particular structure of the protein, e.g., the antigenic determinant or epitope, recognized by the binding molecule. For example, if an antibody is specific for epitope "A," the presence of a polypeptide containing the epitope A, or the presence of free unlabeled A, in a reaction containing free labeled A and the antibody will reduce the amount of labeled A that binds to the antibody.
- 25

- 30 The term "substantially purified" refers to nucleic acid or amino acid sequences that are removed from their natural environment and are isolated or separated, and are at least 60% free, preferably at least 75% free, and most preferably at least 90% free from other components with which they are naturally associated.

- A "substitution" refers to the replacement of one or more amino acids or nucleotides by different amino acids or nucleotides, respectively.
- 35

"Substrate" refers to any suitable rigid or semi-rigid support including membranes, filters, chips, slides, wafers, fibers, magnetic or nonmagnetic beads, gels, tubing, plates, polymers, microparticles and capillaries. The substrate can have a variety of surface forms, such as wells, trenches, pins, channels and pores, to which polynucleotides or polypeptides are bound.

5 "Transformation" describes a process by which exogenous DNA enters and changes a recipient cell. Transformation may occur under natural or artificial conditions according to various methods well known in the art, and may rely on any known method for the insertion of foreign nucleic acid sequences into a prokaryotic or eukaryotic host cell. The method for transformation is selected based on the type of host cell being transformed and may include, but is not limited to, viral
10 infection, electroporation, heat shock, lipofection, and particle bombardment. The term "transformed" cells includes stably transformed cells in which the inserted DNA is capable of replication either as an autonomously replicating plasmid or as part of the host chromosome, as well as transiently transformed cells which express the inserted DNA or RNA for limited periods of time.

A "transgenic organism," as used herein, is any organism, including but not limited to
15 animals and plants, in which one or more of the cells of the organism contains heterologous nucleic acid introduced by way of human intervention, such as by transgenic techniques well known in the art. The nucleic acid is introduced into the cell, directly or indirectly by introduction into a precursor of the cell, by way of deliberate genetic manipulation, such as by microinjection or by infection with a recombinant virus. The term genetic manipulation does not include classical cross-breeding, or in
20 vitro fertilization, but rather is directed to the introduction of a recombinant DNA molecule. The transgenic organisms contemplated in accordance with the present invention include bacteria, cyanobacteria, fungi, and plants and animals. The isolated DNA of the present invention can be introduced into the host by methods known in the art, for example infection, transfection, transformation or transconjugation. Techniques for transferring the DNA of the present invention
25 into such organisms are widely known and provided in references such as Sambrook et al. (1989), supra.

A "variant" of a particular nucleic acid sequence is defined as a nucleic acid sequence having at least 40% sequence identity to the particular nucleic acid sequence over a certain length of one of the nucleic acid sequences using blastn with the "BLAST 2 Sequences" tool Version 2.0.9 (May-07-
30 1999) set at default parameters. Such a pair of nucleic acids may show, for example, at least 50%, at least 60%, at least 70%, at least 80%, at least 85%, at least 90%, at least 95% or at least 98% or greater sequence identity over a certain defined length. A variant may be described as, for example, an "allelic" (as defined above), "splice," "species," or "polymorphic" variant. A splice variant may have significant identity to a reference molecule, but will generally have a greater or lesser number of
35 polynucleotides due to alternate splicing of exons during mRNA processing. The corresponding

polypeptide may possess additional functional domains or lack domains that are present in the reference molecule. Species variants are polynucleotide sequences that vary from one species to another. The resulting polypeptides generally will have significant amino acid identity relative to each other. A polymorphic variant is a variation in the polynucleotide sequence of a particular gene
 5 between individuals of a given species. Polymorphic variants also may encompass "single nucleotide polymorphisms" (SNPs) in which the polynucleotide sequence varies by one nucleotide base. The presence of SNPs may be indicative of, for example, a certain population, a disease state, or a propensity for a disease state.

A "variant" of a particular polypeptide sequence is defined as a polypeptide sequence having
 10 at least 40% sequence identity to the particular polypeptide sequence over a certain length of one of the polypeptide sequences using blastp with the "BLAST 2 Sequences" tool Version 2.0.9 (May-07-1999) set at default parameters. Such a pair of polypeptides may show, for example, at least 50%, at least 60%, at least 70%, at least 80%, at least 90%, at least 95%, or at least 98% or greater sequence identity over a certain defined length of one of the polypeptides.

15 THE INVENTION

The invention is based on the discovery of new human human secretory proteins (HSECP), the polynucleotides encoding HSECP, and the use of these compositions for the diagnosis, treatment, or prevention of cancer, inflammation, and gastrointestinal, cardiovascular, and neurological disorders.

20 Table 1 lists the Incyte clones used to assemble full length nucleotide sequences encoding HSECP. Columns 1 and 2 show the sequence identification numbers (SEQ ID NOs) of the polypeptide and nucleotide sequences, respectively. Column 3 shows the clone IDs of the Incyte clones in which nucleic acids encoding each HSECP were identified, and column 4 shows the cDNA libraries from which these clones were isolated. Column 5 shows Incyte clones and their
 25 corresponding cDNA libraries. Clones for which cDNA libraries are not indicated were derived from pooled cDNA libraries. The Incyte clones in column 5 were used to assemble the consensus nucleotide sequence of each HSECP and are useful as fragments in hybridization technologies.

The columns of Table 2 show various properties of each of the polypeptides of the invention: column 1 references the SEQ ID NO; column 2 shows the number of amino acid residues in each
 30 polypeptide; column 3 shows potential phosphorylation sites; column 4 shows potential glycosylation sites; column 5 shows the amino acid residues comprising signature sequences and motifs; and column 6 shows analytical methods and in some cases, searchable databases to which the analytical methods were applied. The methods of column 6 were used to characterize each polypeptide through sequence homology and protein motifs. In column 5, the first line of each cell lists the amino acid
 35 residues comprising predicted signal peptide sequences located at the amino terminus of each

HSECP. Additional identifying motifs or signatures, such as a somatomedin B signature in SEQ ID NO:16 and seven putative transmembrane domains in SEQ ID NO:18, are also listed in column 5.

The columns of Table 3 show the tissue-specificity and diseases, disorders, or conditions associated with nucleotide sequences encoding HSECP. The first column of Table 3 lists the nucleotide SEQ ID NOs. Column 2 lists fragments of the nucleotide sequences of column 1. These fragments are useful, for example, in hybridization or amplification technologies to identify SEQ ID NO:23-44 and to distinguish between SEQ ID NO:23-44 and related polynucleotide sequences. The polypeptides encoded by these fragments are useful, for example, as immunogenic peptides. Column 3 lists tissue categories which express HSECP as a fraction of total tissues expressing HSECP.

Column 4 lists diseases, disorders, or conditions associated with those tissues expressing HSECP as a fraction of total tissues expressing HSECP. Column 5 lists the vectors used to subclone each cDNA library. In particular, three out of four cDNA libraries which express SEQ ID NO:23 are derived from cartilage and synovia associated with joint inflammation, and four out of five cDNA libraries which express SEQ ID NO:29 are derived from intestinal tissue. Furthermore, about half of the cDNA libraries expressing SEQ ID NO:34 are associated with inflammation or the hematopoietic/immune system. Likewise, about half of the cDNA libraries expressing SEQ ID NO:35 are associated with inflammation or the hematopoietic/immune system, and in particular, with inflammation of the joints. In addition, 82% of the cDNA libraries expressing SEQ ID NO:37 are derived from tissues of the nervous system. Finally, expression of SEQ ID NO:39 is detected solely in a subtracted prostate tumor cDNA library, and expression of SEQ ID NO:43 is detected only in two cDNA libraries derived from heart tissue.

The columns of Table 4 show descriptions of the tissues used to construct the cDNA libraries from which cDNA clones encoding HSECP were isolated. Column 1 references the nucleotide SEQ ID NOs, column 2 shows the cDNA libraries from which these clones were isolated, and column 3 shows the tissue origins and other descriptive information relevant to the cDNA libraries in column 2.

The invention also encompasses HSECP variants. A preferred HSECP variant is one which has at least about 80%, or alternatively at least about 90%, or even at least about 95% amino acid sequence identity to the HSECP amino acid sequence, and which contains at least one functional or structural characteristic of HSECP.

The invention also encompasses polynucleotides which encode HSECP. In a particular embodiment, the invention encompasses a polynucleotide sequence comprising a sequence selected from the group consisting of SEQ ID NO:23-44, which encodes HSECP. The polynucleotide sequences of SEQ ID NO:23-44, as presented in the Sequence Listing, embrace the equivalent RNA sequences, wherein occurrences of the nitrogenous base thymine are replaced with uracil, and the sugar backbone is composed of ribose instead of deoxyribose.

The invention also encompasses a variant of a polynucleotide sequence encoding HSECP. In particular, such a variant polynucleotide sequence will have at least about 70%, or alternatively at least about 85%, or even at least about 95% polynucleotide sequence identity to the polynucleotide sequence encoding HSECP. A particular aspect of the invention encompasses a variant of a polynucleotide sequence comprising a sequence selected from the group consisting of SEQ ID NO:23-44 which has at least about 70%, or alternatively at least about 85%, or even at least about 95% polynucleotide sequence identity to a nucleic acid sequence selected from the group consisting of SEQ ID NO:23-44. Any one of the polynucleotide variants described above can encode an amino acid sequence which contains at least one functional or structural characteristic of HSECP.

It will be appreciated by those skilled in the art that as a result of the degeneracy of the genetic code, a multitude of polynucleotide sequences encoding HSECP, some bearing minimal similarity to the polynucleotide sequences of any known and naturally occurring gene, may be produced. Thus, the invention contemplates each and every possible variation of polynucleotide sequence that could be made by selecting combinations based on possible codon choices. These combinations are made in accordance with the standard triplet genetic code as applied to the polynucleotide sequence of naturally occurring HSECP, and all such variations are to be considered as being specifically disclosed.

Although nucleotide sequences which encode HSECP and its variants are generally capable of hybridizing to the nucleotide sequence of the naturally occurring HSECP under appropriately selected conditions of stringency, it may be advantageous to produce nucleotide sequences encoding HSECP or its derivatives possessing a substantially different codon usage, e.g., inclusion of non-naturally occurring codons. Codons may be selected to increase the rate at which expression of the peptide occurs in a particular prokaryotic or eukaryotic host in accordance with the frequency with which particular codons are utilized by the host. Other reasons for substantially altering the nucleotide sequence encoding HSECP and its derivatives without altering the encoded amino acid sequences include the production of RNA transcripts having more desirable properties, such as a greater half-life, than transcripts produced from the naturally occurring sequence.

The invention also encompasses production of DNA sequences which encode HSECP and HSECP derivatives, or fragments thereof, entirely by synthetic chemistry. After production, the synthetic sequence may be inserted into any of the many available expression vectors and cell systems using reagents well known in the art. Moreover, synthetic chemistry may be used to introduce mutations into a sequence encoding HSECP or any fragment thereof.

Also encompassed by the invention are polynucleotide sequences that are capable of hybridizing to the claimed polynucleotide sequences, and, in particular, to those shown in SEQ ID NO:23-44 and fragments thereof under various conditions of stringency. (See, e.g., Wahl, G.M. and

G33S.L. Berger (1987) *Methods Enzymol.* 152:399-407; Kimmel, A.R. (1987) *Methods Enzymol.* 152:507-511.) Hybridization conditions, including annealing and wash conditions, are described in "Definitions."

Methods for DNA sequencing are well known in the art and may be used to practice any of the embodiments of the invention. The methods may employ such enzymes as the Klenow fragment of DNA polymerase I, SEQUENASE (US Biochemical, Cleveland OH), Taq polymerase (Perkin-Elmer), thermostable T7 polymerase (Amersham Pharmacia Biotech, Piscataway NJ), or combinations of polymerases and proofreading exonucleases such as those found in the ELONGASE amplification system (Life Technologies, Gaithersburg MD). Preferably, sequence preparation is automated with machines such as the MICROLAB 2200 liquid transfer system (Hamilton, Reno NV), PTC200 thermal cycler (MJ Research, Watertown MA) and ABI CATALYST 800 thermal cycler (Perkin-Elmer). Sequencing is then carried out using either the ABI 373 or 377 DNA sequencing system (Perkin-Elmer), the MEGABACE 1000 DNA sequencing system (Molecular Dynamics, Sunnyvale CA), or other systems known in the art. The resulting sequences are analyzed using a variety of algorithms which are well known in the art. (See, e.g., Ausubel, F.M. (1997) Short Protocols in Molecular Biology, John Wiley & Sons, New York NY, unit 7.7; Meyers, R.A. (1995) Molecular Biology and Biotechnology, Wiley VCH, New York NY, pp. 856-853.)

The nucleic acid sequences encoding HSECP may be extended utilizing a partial nucleotide sequence and employing various PCR-based methods known in the art to detect upstream sequences, such as promoters and regulatory elements. For example, one method which may be employed, restriction-site PCR, uses universal and nested primers to amplify unknown sequence from genomic DNA within a cloning vector. (See, e.g., Sarkar, G. (1993) *PCR Methods Applic.* 2:318-322.) Another method, inverse PCR, uses primers that extend in divergent directions to amplify unknown sequence from a circularized template. The template is derived from restriction fragments comprising a known genomic locus and surrounding sequences. (See, e.g., Triglia, T. et al. (1988) *Nucleic Acids Res.* 16:8186.) A third method, capture PCR, involves PCR amplification of DNA fragments adjacent to known sequences in human and yeast artificial chromosome DNA. (See, e.g., Lagerstrom, M. et al. (1991) *PCR Methods Applic.* 1:111-119.) In this method, multiple restriction enzyme digestions and ligations may be used to insert an engineered double-stranded sequence into a region of unknown sequence before performing PCR. Other methods which may be used to retrieve unknown sequences are known in the art. (See, e.g., Parker, J.D. et al. (1991) *Nucleic Acids Res.* 19:3055-3060). Additionally, one may use PCR, nested primers, and PROMOTERFINDER libraries (Clontech, Palo Alto CA) to walk genomic DNA. This procedure avoids the need to screen libraries and is useful in finding intron/exon junctions. For all PCR-based methods, primers may be designed using commercially available software, such as OLIGO 4.06 Primer Analysis software (National

Biosciences, Plymouth MN) or another appropriate program, to be about 22 to 30 nucleotides in length, to have a GC content of about 50% or more, and to anneal to the template at temperatures of about 68°C to 72°C.

When screening for full-length cDNAs, it is preferable to use libraries that have been size-selected to include larger cDNAs. In addition, random-primed libraries, which often include sequences containing the 5' regions of genes, are preferable for situations in which an oligo d(T) library does not yield a full-length cDNA. Genomic libraries may be useful for extension of sequence into 5' non-transcribed regulatory regions.

Capillary electrophoresis systems which are commercially available may be used to analyze the size or confirm the nucleotide sequence of sequencing or PCR products. In particular, capillary sequencing may employ flowable polymers for electrophoretic separation, four different nucleotide-specific, laser-stimulated fluorescent dyes, and a charge coupled device camera for detection of the emitted wavelengths. Output/light intensity may be converted to electrical signal using appropriate software (e.g., GENOTYPER and SEQUENCE NAVIGATOR, Perkin-Elmer), and the entire process from loading of samples to computer analysis and electronic data display may be computer controlled. Capillary electrophoresis is especially preferable for sequencing small DNA fragments which may be present in limited amounts in a particular sample.

In another embodiment of the invention, polynucleotide sequences or fragments thereof which encode HSECP may be cloned in recombinant DNA molecules that direct expression of HSECP, or fragments or functional equivalents thereof, in appropriate host cells. Due to the inherent degeneracy of the genetic code, other DNA sequences which encode substantially the same or a functionally equivalent amino acid sequence may be produced and used to express HSECP.

The nucleotide sequences of the present invention can be engineered using methods generally known in the art in order to alter HSECP-encoding sequences for a variety of purposes including, but not limited to, modification of the cloning, processing, and/or expression of the gene product. DNA shuffling by random fragmentation and PCR reassembly of gene fragments and synthetic oligonucleotides may be used to engineer the nucleotide sequences. For example, oligonucleotide-mediated site-directed mutagenesis may be used to introduce mutations that create new restriction sites, alter glycosylation patterns, change codon preference, produce splice variants, and so forth.

The nucleotides of the present invention may be subjected to DNA shuffling techniques such as MOLECULARBREEDING (Maxygen Inc., Santa Clara CA; described in U.S. Patent Number 5,837,458; Chang, C.-C. et al. (1999) Nat. Biotechnol. 17:793-797; Christians, F.C. et al. (1999) Nat. Biotechnol. 17:259-264; and Cramer, A. et al. (1996) Nat. Biotechnol. 14:315-319) to alter or improve the biological properties of HSECP, such as its biological or enzymatic activity or its ability to bind to other molecules or compounds. DNA shuffling is a process by which a library of gene

variants is produced using PCR-mediated recombination of gene fragments. The library is then subjected to selection or screening procedures that identify those gene variants with the desired properties. These preferred variants may then be pooled and further subjected to recursive rounds of DNA shuffling and selection/screening. Thus, genetic diversity is created through "artificial" breeding and rapid molecular evolution. For example, fragments of a single gene containing random point mutations may be recombined, screened, and then reshuffled until the desired properties are optimized. Alternatively, fragments of a given gene may be recombined with fragments of homologous genes in the same gene family, either from the same or different species, thereby maximizing the genetic diversity of multiple naturally occurring genes in a directed and controllable manner.

In another embodiment, sequences encoding HSECP may be synthesized, in whole or in part, using chemical methods well known in the art. (See, e.g., Caruthers, M.H. et al. (1980) *Nucleic Acids Symp. Ser. 7*:215-223; and Horn, T. et al. (1980) *Nucleic Acids Symp. Ser. 7*:225-232.)

Alternatively, HSECP itself or a fragment thereof may be synthesized using chemical methods. For example, peptide synthesis can be performed using various solid-phase techniques. (See, e.g., Roberge, J.Y. et al. (1995) *Science* 269:202-204.) Automated synthesis may be achieved using the ABI 431A peptide synthesizer (Perkin-Elmer). Additionally, the amino acid sequence of HSECP, or any part thereof, may be altered during direct synthesis and/or combined with sequences from other proteins, or any part thereof, to produce a variant polypeptide.

The peptide may be substantially purified by preparative high performance liquid chromatography. (See, e.g., Chiez, R.M. and F.Z. Regnier (1990) *Methods Enzymol.* 182:392-421.) The composition of the synthetic peptides may be confirmed by amino acid analysis or by sequencing. (See, e.g., Creighton, T. (1984) Proteins, Structures and Molecular Properties, WH Freeman, New York NY.)

In order to express a biologically active HSECP, the nucleotide sequences encoding HSECP or derivatives thereof may be inserted into an appropriate expression vector, i.e., a vector which contains the necessary elements for transcriptional and translational control of the inserted coding sequence in a suitable host. These elements include regulatory sequences, such as enhancers, constitutive and inducible promoters, and 5' and 3' untranslated regions in the vector and in polynucleotide sequences encoding HSECP. Such elements may vary in their strength and specificity. Specific initiation signals may also be used to achieve more efficient translation of sequences encoding HSECP. Such signals include the ATG initiation codon and adjacent sequences, e.g. the Kozak sequence. In cases where sequences encoding HSECP and its initiation codon and upstream regulatory sequences are inserted into the appropriate expression vector, no additional transcriptional or translational control signals may be needed. However, in cases where only coding

sequence, or a fragment thereof, is inserted, exogenous translational control signals including an in-frame ATG initiation codon should be provided by the vector. Exogenous translational elements and initiation codons may be of various origins, both natural and synthetic. The efficiency of expression may be enhanced by the inclusion of enhancers appropriate for the particular host cell system used.

5 (See, e.g., Scharf, D. et al. (1994) *Results Probl. Cell Differ.* 20:125-162.)

Methods which are well known to those skilled in the art may be used to construct expression vectors containing sequences encoding HSECP and appropriate transcriptional and translational control elements. These methods include in vitro recombinant DNA techniques, synthetic techniques, and in vivo genetic recombination. (See, e.g., Sambrook, J. et al. (1989) Molecular Cloning, A

10 Laboratory Manual, Cold Spring Harbor Press, Plainview NY, ch. 4, 8, and 16-17; Ausubel, F.M. et al. (1995) Current Protocols in Molecular Biology, John Wiley & Sons, New York NY, ch. 9, 13, and 16.)

A variety of expression vector/host systems may be utilized to contain and express sequences encoding HSECP. These include, but are not limited to, microorganisms such as bacteria transformed
15 with recombinant bacteriophage, plasmid, or cosmid DNA expression vectors; yeast transformed with yeast expression vectors; insect cell systems infected with viral expression vectors (e.g., baculovirus); plant cell systems transformed with viral expression vectors (e.g., cauliflower mosaic virus, CaMV, or tobacco mosaic virus, TMV) or with bacterial expression vectors (e.g., Ti or pBR322 plasmids); or animal cell systems. The invention is not limited by the host cell employed.

20 In bacterial systems, a number of cloning and expression vectors may be selected depending upon the use intended for polynucleotide sequences encoding HSECP. For example, routine cloning, subcloning, and propagation of polynucleotide sequences encoding HSECP can be achieved using a multifunctional E. coli vector such as PBLUESCRIPT (Stratagene, La Jolla CA) or PSPORT1 plasmid (Life Technologies). Ligation of sequences encoding HSECP into the vector's multiple
25 cloning site disrupts the *lacZ* gene, allowing a colorimetric screening procedure for identification of transformed bacteria containing recombinant molecules. In addition, these vectors may be useful for in vitro transcription, dideoxy sequencing, single strand rescue with helper phage, and creation of nested deletions in the cloned sequence. (See, e.g., Van Heeke, G. and S.M. Schuster (1989) *J. Biol. Chem.* 264:5503-5509.) When large quantities of HSECP are needed, e.g. for the production of
30 antibodies, vectors which direct high level expression of HSECP may be used. For example, vectors containing the strong, inducible T5 or T7 bacteriophage promoter may be used.

Yeast expression systems may be used for production of HSECP. A number of vectors containing constitutive or inducible promoters, such as alpha factor, alcohol oxidase, and PGH promoters, may be used in the yeast Saccharomyces cerevisiae or Pichia pastoris. In addition, such
35 vectors direct either the secretion or intracellular retention of expressed proteins and enable

integration of foreign sequences into the host genome for stable propagation. (See, e.g., Ausubel, 1995, supra; Bitter, G.A. et al. (1987) *Methods Enzymol.* 153:516-544; and Scorer, C.A. et al. (1994) *Bio/Technology* 12:181-184.)

Plant systems may also be used for expression of HSECP. Transcription of sequences encoding HSECP may be driven viral promoters, e.g., the 35S and 19S promoters of CaMV used alone or in combination with the omega leader sequence from TMV (Takamatsu, N. (1987) *EMBO J.* 6:307-311). Alternatively, plant promoters such as the small subunit of RUBISCO or heat shock promoters may be used. (See, e.g., Coruzzi, G. et al. (1984) *EMBO J.* 3:1671-1680; Broglie, R. et al. (1984) *Science* 224:838-843; and Winter, J. et al. (1991) *Results Probl. Cell Differ.* 17:85-105.)

These constructs can be introduced into plant cells by direct DNA transformation or pathogen-mediated transfection. (See, e.g., The McGraw Hill Yearbook of Science and Technology (1992) McGraw Hill, New York NY, pp. 191-196.)

In mammalian cells, a number of viral-based expression systems may be utilized. In cases where an adenovirus is used as an expression vector, sequences encoding HSECP may be ligated into an adenovirus transcription/translation complex consisting of the late promoter and tripartite leader sequence. Insertion in a non-essential E1 or E3 region of the viral genome may be used to obtain infective virus which expresses HSECP in host cells. (See, e.g., Logan, J. and T. Shenk (1984) *Proc. Natl. Acad. Sci. USA* 81:3655-3659.) In addition, transcription enhancers, such as the Rous sarcoma virus (RSV) enhancer, may be used to increase expression in mammalian host cells. SV40 or EBV-based vectors may also be used for high-level protein expression.

Human artificial chromosomes (HACs) may also be employed to deliver larger fragments of DNA than can be contained in and expressed from a plasmid. HACs of about 6 kb to 10 Mb are constructed and delivered via conventional delivery methods (liposomes, polycationic amino polymers, or vesicles) for therapeutic purposes. (See, e.g., Harrington, J.J. et al. (1997) *Nat. Genet.* 15:345-355.)

For long term production of recombinant proteins in mammalian systems, stable expression of HSECP in cell lines is preferred. For example, sequences encoding HSECP can be transformed into cell lines using expression vectors which may contain viral origins of replication and/or endogenous expression elements and a selectable marker gene on the same or on a separate vector. Following the introduction of the vector, cells may be allowed to grow for about 1 to 2 days in enriched media before being switched to selective media. The purpose of the selectable marker is to confer resistance to a selective agent, and its presence allows growth and recovery of cells which successfully express the introduced sequences. Resistant clones of stably transformed cells may be propagated using tissue culture techniques appropriate to the cell type.

Any number of selection systems may be used to recover transformed cell lines. These

include, but are not limited to, the herpes simplex virus thymidine kinase and adenine phosphoribosyltransferase genes, for use in *tk* and *apr* cells, respectively. (See, e.g., Wigler, M. et al. (1977) Cell 11:223-232; Lowy, I. et al. (1980) Cell 22:817-823.) Also, antimetabolite, antibiotic, or herbicide resistance can be used as the basis for selection. For example, *dhfr* confers resistance to methotrexate; *neo* confers resistance to the aminoglycosides neomycin and G-418; and *als* and *pat* confer resistance to chlorsulfuron and phosphinotricin acetyltransferase, respectively. (See, e.g., Wigler, M. et al. (1980) Proc. Natl. Acad. Sci. USA 77:3567-3570; Colbere-Garapin, F. et al. (1981) J. Mol. Biol. 150:1-14.) Additional selectable genes have been described, e.g., *trpB* and *hisD*, which alter cellular requirements for metabolites. (See, e.g., Hartman, S.C. and R.C. Mulligan (1988) Proc. Natl. Acad. Sci. USA 85:8047-8051.) Visible markers, e.g., anthocyanins, green fluorescent proteins (GFP; Clontech), β glucuronidase and its substrate β -glucuronide, or luciferase and its substrate luciferin may be used. These markers can be used not only to identify transformants, but also to quantify the amount of transient or stable protein expression attributable to a specific vector system. (See, e.g., Rhodes, C.A. (1995) Methods Mol. Biol. 55:121-131.)

Although the presence/absence of marker gene expression suggests that the gene of interest is also present, the presence and expression of the gene may need to be confirmed. For example, if the sequence encoding HSECP is inserted within a marker gene sequence, transformed cells containing sequences encoding HSECP can be identified by the absence of marker gene function. Alternatively, a marker gene can be placed in tandem with a sequence encoding HSECP under the control of a single promoter. Expression of the marker gene in response to induction or selection usually indicates expression of the tandem gene as well.

In general, host cells that contain the nucleic acid sequence encoding HSECP and that express HSECP may be identified by a variety of procedures known to those of skill in the art. These procedures include, but are not limited to, DNA-DNA or DNA-RNA hybridizations, PCR amplification, and protein bioassay or immunoassay techniques which include membrane, solution, or chip based technologies for the detection and/or quantification of nucleic acid or protein sequences.

Immunological methods for detecting and measuring the expression of HSECP using either specific polyclonal or monoclonal antibodies are known in the art. Examples of such techniques include enzyme-linked immunosorbent assays (ELISAs), radioimmunoassays (RIAs), and fluorescence activated cell sorting (FACS). A two-site, monoclonal-based immunoassay utilizing monoclonal antibodies reactive to two non-interfering epitopes on HSECP is preferred, but a competitive binding assay may be employed. These and other assays are well known in the art. (See, e.g., Hampton, R. et al. (1990) Serological Methods, a Laboratory Manual, APS Press, St. Paul MN, Sect. IV; Coligan, J.E. et al. (1997) Current Protocols in Immunology, Greene Pub. Associates and Wiley-Interscience, New York NY; and Pound, J.D. (1998) Immunochemical Protocols, Humana

Press, Totowa NJ.)

A wide variety of labels and conjugation techniques are known by those skilled in the art and may be used in various nucleic acid and amino acid assays. Means for producing labeled hybridization or PCR probes for detecting sequences related to polynucleotides encoding HSECP include oligolabeling, nick translation, end-labeling, or PCR amplification using a labeled nucleotide. Alternatively, the sequences encoding HSECP, or any fragments thereof, may be cloned into a vector for the production of an mRNA probe. Such vectors are known in the art, are commercially available, and may be used to synthesize RNA probes in vitro by addition of an appropriate RNA polymerase such as T7, T3, or SP6 and labeled nucleotides. These procedures may be conducted using a variety of commercially available kits, such as those provided by Amersham Pharmacia Biotech, Promega (Madison WI), and US Biochemical. Suitable reporter molecules or labels which may be used for ease of detection include radionuclides, enzymes, fluorescent, chemiluminescent, or chromogenic agents, as well as substrates, cofactors, inhibitors, magnetic particles, and the like.

Host cells transformed with nucleotide sequences encoding HSECP may be cultured under conditions suitable for the expression and recovery of the protein from cell culture. The protein produced by a transformed cell may be secreted or retained intracellularly depending on the sequence and/or the vector used. As will be understood by those of skill in the art, expression vectors containing polynucleotides which encode HSECP may be designed to contain signal sequences which direct secretion of HSECP through a prokaryotic or eukaryotic cell membrane.

In addition, a host cell strain may be chosen for its ability to modulate expression of the inserted sequences or to process the expressed protein in the desired fashion. Such modifications of the polypeptide include, but are not limited to, acetylation, carboxylation, glycosylation, phosphorylation, lipidation, and acylation. Post-translational processing which cleaves a "prepro" or "pro" form of the protein may also be used to specify protein targeting, folding, and/or activity.

Different host cells which have specific cellular machinery and characteristic mechanisms for post-translational activities (e.g., CHO, HeLa, MDCK, HEK293, and WI38) are available from the American Type Culture Collection (ATCC, Manassas VA) and may be chosen to ensure the correct modification and processing of the foreign protein.

In another embodiment of the invention, natural, modified, or recombinant nucleic acid sequences encoding HSECP may be ligated to a heterologous sequence resulting in translation of a fusion protein in any of the aforementioned host systems. For example, a chimeric HSECP protein containing a heterologous moiety that can be recognized by a commercially available antibody may facilitate the screening of peptide libraries for inhibitors of HSECP activity. Heterologous protein and peptide moieties may also facilitate purification of fusion proteins using commercially available affinity matrices. Such moieties include, but are not limited to, glutathione S-transferase (GST),

maltose binding protein (MBP), thioredoxin (Trx), calmodulin binding peptide (CBP), 6-His, FLAG, *c-myc*, and hemagglutinin (HA). GST, MBP, Trx, CBP, and 6-His enable purification of their cognate fusion proteins on immobilized glutathione, maltose, phenylarsine oxide, calmodulin, and metal-chelate resins, respectively. FLAG, *c-myc*, and hemagglutinin (HA) enable immunoaffinity purification of fusion proteins using commercially available monoclonal and polyclonal antibodies that specifically recognize these epitope tags. A fusion protein may also be engineered to contain a proteolytic cleavage site located between the HSECP encoding sequence and the heterologous protein sequence, so that HSECP may be cleaved away from the heterologous moiety following purification. Methods for fusion protein expression and purification are discussed in Ausubel (1995, *supra*, ch. 10). A variety of commercially available kits may also be used to facilitate expression and purification of fusion proteins.

In a further embodiment of the invention, synthesis of radiolabeled HSECP may be achieved *in vitro* using the TNT rabbit reticulocyte lysate or wheat germ extract system (Promega). These systems couple transcription and translation of protein-coding sequences operably associated with the T7, T3, or SP6 promoters. Translation takes place in the presence of a radiolabeled amino acid precursor, for example, ³⁵S-methionine.

Fragments of HSECP may be produced not only by recombinant means, but also by direct peptide synthesis using solid-phase techniques. (See, e.g., Creighton, *supra*, pp. 55-60.) Protein synthesis may be performed by manual techniques or by automation. Automated synthesis may be achieved, for example, using the ABI 431A peptide synthesizer (Perkin-Elmer). Various fragments of HSECP may be synthesized separately and then combined to produce the full length molecule.

THERAPEUTICS

Chemical and structural similarity, e.g., in the context of sequences and motifs, exists between regions of HSECP and human secretory proteins. In addition, the expression of HSECP is closely associated with cancer, inflammation, and gastrointestinal, cardiovascular, and neurological disorders. Therefore, HSECP appears to play a role in cancer, inflammation, and gastrointestinal, cardiovascular, and neurological disorders. In the treatment of disorders associated with increased HSECP expression or activity, it is desirable to decrease the expression or activity of HSECP. In the treatment of disorders associated with decreased HSECP expression or activity, it is desirable to increase the expression or activity of HSECP.

Therefore, in one embodiment, HSECP or a fragment or derivative thereof may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of HSECP. Examples of such disorders include, but are not limited to, a cancer such as adenocarcinoma, leukemia, lymphoma, melanoma, myeloma, sarcoma, teratocarcinoma, and, in particular, cancers of the adrenal gland, bladder, bone, bone marrow, brain, breast, cervix, gall

- bladder, ganglia, gastrointestinal tract, heart, kidney, liver, lung, muscle, ovary, pancreas, parathyroid, penis, prostate, salivary glands, skin, spleen, testis, thymus, thyroid, and uterus; an inflammatory disorder such as acquired immunodeficiency syndrome (AIDS), Addison's disease, adult respiratory distress syndrome, allergies, ankylosing spondylitis, amyloidosis, anemia, asthma,
- 5 atherosclerosis, autoimmune hemolytic anemia, autoimmune thyroiditis, autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED), bronchitis, cholecystitis, contact dermatitis, Crohn's disease, atopic dermatitis, dermatomyositis, diabetes mellitus, emphysema, episodic lymphopenia with lymphocytotoxins, erythroblastosis fetalis, erythema nodosum, atrophic gastritis, glomerulonephritis, Goodpasture's syndrome, gout, Graves' disease, Hashimoto's
- 10 thyroiditis, hypereosinophilia, irritable bowel syndrome, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, psoriasis, Reiter's syndrome, rheumatoid arthritis, scleroderma, Sjögren's syndrome, systemic anaphylaxis, systemic lupus erythematosus, systemic sclerosis, thrombocytopenic purpura, ulcerative colitis, uveitis, Werner syndrome, complications of cancer, hemodialysis, and extracorporeal
- 15 circulation, viral, bacterial, fungal, parasitic, protozoal, and helminthic infections, and trauma; a gastrointestinal disorder such as dysphagia, peptic esophagitis, esophageal spasm, esophageal stricture, esophageal carcinoma, dyspepsia, indigestion, gastritis, gastric carcinoma, anorexia, nausea, emesis, gastroparesis, antral or pyloric edema, abdominal angina, pyrosis, gastroenteritis, intestinal obstruction, infections of the intestinal tract, peptic ulcer, cholelithiasis, cholecystitis, cholestasis,
- 20 pancreatitis, pancreatic carcinoma, biliary tract disease, hepatitis, hyperbilirubinemia, cirrhosis, passive congestion of the liver, hepatoma, infectious colitis, ulcerative colitis, ulcerative proctitis, Crohn's disease, Whipple's disease, Mallory-Weiss syndrome, colonic carcinoma, colonic obstruction, irritable bowel syndrome, short bowel syndrome, diarrhea, constipation, gastrointestinal hemorrhage, acquired immunodeficiency syndrome (AIDS) enteropathy, jaundice, hepatic
- 25 encephalopathy, hepatorenal syndrome, hepatic steatosis, hemochromatosis, Wilson's disease, alpha₁-antitrypsin deficiency, Reye's syndrome, primary sclerosing cholangitis, liver infarction, portal vein obstruction and thrombosis, centrilobular necrosis, peliosis hepatis, hepatic vein thrombosis, veno-occlusive disease, preeclampsia, eclampsia, acute fatty liver of pregnancy, intrahepatic cholestasis of pregnancy, and hepatic tumors including nodular hyperplasias, adenomas, and carcinomas; a
- 30 cardiovascular disorder, and in particular, a disorder of the heart such as congestive heart failure, ischemic heart disease, angina pectoris, myocardial infarction, hypertensive heart disease, degenerative valvular heart disease, calcific aortic valve stenosis, congenitally bicuspid aortic valve, mitral annular calcification, mitral valve prolapse, rheumatic fever and rheumatic heart disease, infective endocarditis, nonbacterial thrombotic endocarditis, endocarditis of systemic lupus
- 35 erythematosus, carcinoid heart disease, cardiomyopathy, myocarditis, pericarditis, neoplastic heart

disease, congenital heart disease, and complications of cardiac transplantation; and a neurological disorder such as epilepsy, ischemic cerebrovascular disease, stroke, cerebral neoplasms, Alzheimer's disease, Pick's disease, Huntington's disease, dementia, Parkinson's disease and other extrapyramidal disorders, amyotrophic lateral sclerosis and other motor neuron disorders, progressive neural muscular atrophy, retinitis pigmentosa, hereditary ataxias, multiple sclerosis and other demyelinating diseases, bacterial and viral meningitis, brain abscess, subdural empyema, epidural abscess, suppurative intracranial thrombophlebitis, myelitis and radiculitis, viral central nervous system disease, prion diseases including kuru, Creutzfeldt-Jakob disease, and Gerstmann-Straussler-Scheinker syndrome, fatal familial insomnia, nutritional and metabolic diseases of the nervous system, neurofibromatosis, tuberous sclerosis, cerebelloretinal hemangioblastomatosis, encephalotrigeminal syndrome, mental retardation and other developmental disorders of the central nervous system, cerebral palsy, neuroskeletal disorders, autonomic nervous system disorders, cranial nerve disorders, spinal cord diseases, muscular dystrophy and other neuromuscular disorders, peripheral nervous system disorders, dermatomyositis and polymyositis, inherited, metabolic, endocrine, and toxic myopathies, myasthenia gravis, periodic paralysis, mental disorders including mood, anxiety, and schizophrenic disorders, seasonal affective disorder (SAD), akathisia, amnesia, catatonia, diabetic neuropathy, tardive dyskinesia, dystonias, paranoid psychoses, postherpetic neuralgia, and Tourette's disorder.

In another embodiment, a vector capable of expressing HSECP or a fragment or derivative thereof may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of HSECP including, but not limited to, those described above.

In a further embodiment, a pharmaceutical composition comprising a substantially purified HSECP in conjunction with a suitable pharmaceutical carrier may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of HSECP including, but not limited to, those provided above.

In still another embodiment, an agonist which modulates the activity of HSECP may be administered to a subject to treat or prevent a disorder associated with decreased expression or activity of HSECP including, but not limited to, those listed above.

In a further embodiment, an antagonist of HSECP may be administered to a subject to treat or prevent a disorder associated with increased expression or activity of HSECP. Examples of such disorders include, but are not limited to, those cancer, inflammation, and gastrointestinal, cardiovascular, and neurological disorders described above. In one aspect, an antibody which specifically binds HSECP may be used directly as an antagonist or indirectly as a targeting or delivery mechanism for bringing a pharmaceutical agent to cells or tissues which express HSECP.

In an additional embodiment, a vector expressing the complement of the polynucleotide

encoding HSECP may be administered to a subject to treat or prevent a disorder associated with increased expression or activity of HSECP including, but not limited to, those described above.

In other embodiments, any of the proteins, antagonists, antibodies, agonists, complementary sequences, or vectors of the invention may be administered in combination with other appropriate therapeutic agents. Selection of the appropriate agents for use in combination therapy may be made by one of ordinary skill in the art, according to conventional pharmaceutical principles. The combination of therapeutic agents may act synergistically to effect the treatment or prevention of the various disorders described above. Using this approach, one may be able to achieve therapeutic efficacy with lower dosages of each agent, thus reducing the potential for adverse side effects.

An antagonist of HSECP may be produced using methods which are generally known in the art. In particular, purified HSECP may be used to produce antibodies or to screen libraries of pharmaceutical agents to identify those which specifically bind HSECP. Antibodies to HSECP may also be generated using methods that are well known in the art. Such antibodies may include, but are not limited to, polyclonal, monoclonal, chimeric, and single chain antibodies, Fab fragments, and fragments produced by a Fab expression library. Neutralizing antibodies (i.e., those which inhibit dimer formation) are generally preferred for therapeutic use.

For the production of antibodies, various hosts including goats, rabbits, rats, mice, humans, and others may be immunized by injection with HSECP or with any fragment or oligopeptide thereof which has immunogenic properties. Depending on the host species, various adjuvants may be used to increase immunological response. Such adjuvants include, but are not limited to, Freund's, mineral gels such as aluminum hydroxide, and surface active substances such as lysolecithin, pluronic polyols, polyanions, peptides, oil emulsions, KLH, and dinitrophenol. Among adjuvants used in humans, BCG (bacilli Calmette-Guerin) and Corynebacterium parvum are especially preferable.

It is preferred that the oligopeptides, peptides, or fragments used to induce antibodies to HSECP have an amino acid sequence consisting of at least about 5 amino acids, and generally will consist of at least about 10 amino acids. It is also preferable that these oligopeptides, peptides, or fragments are identical to a portion of the amino acid sequence of the natural protein and contain the entire amino acid sequence of a small, naturally occurring molecule. Short stretches of HSECP amino acids may be fused with those of another protein, such as KLH, and antibodies to the chimeric molecule may be produced.

Monoclonal antibodies to HSECP may be prepared using any technique which provides for the production of antibody molecules by continuous cell lines in culture. These include, but are not limited to, the hybridoma technique, the human B-cell hybridoma technique, and the EBV-hybridoma technique. (See, e.g., Kohler, G. et al. (1975) Nature 256:495-497; Kozbor, D. et al. (1985) J. Immunol. Methods 81:31-42; Cote, R.J. et al. (1983) Proc. Natl. Acad. Sci. USA 80:2026-2030; and

Cole, S.P. et al. (1984) Mol. Cell Biol. 62:109-120.)

In addition, techniques developed for the production of "chimeric antibodies," such as the splicing of mouse antibody genes to human antibody genes to obtain a molecule with appropriate antigen specificity and biological activity, can be used. (See, e.g., Morrison, S.L. et al. (1984) Proc. Natl. Acad. Sci. USA 81:6851-6855; Neuberger, M.S. et al. (1984) Nature 312:604-608; and Takeda, S. et al. (1985) Nature 314:452-454.) Alternatively, techniques described for the production of single chain antibodies may be adapted, using methods known in the art, to produce HSECP-specific single chain antibodies. Antibodies with related specificity, but of distinct idiotypic composition, may be generated by chain shuffling from random combinatorial immunoglobulin libraries. (See, e.g.,

10 Burton, D.R. (1991) Proc. Natl. Acad. Sci. USA 88:10134-10137.)

Antibodies may also be produced by inducing *in vivo* production in the lymphocyte population or by screening immunoglobulin libraries or panels of highly specific binding reagents as disclosed in the literature. (See, e.g., Orlandi, R. et al. (1989) Proc. Natl. Acad. Sci. USA 86:3833-3837; Winter, G. et al. (1991) Nature 349:293-299.)

15 Antibody fragments which contain specific binding sites for HSECP may also be generated. For example, such fragments include, but are not limited to, F(ab')₂ fragments produced by pepsin digestion of the antibody molecule and Fab fragments generated by reducing the disulfide bridges of the F(ab')₂ fragments. Alternatively, Fab expression libraries may be constructed to allow rapid and easy identification of monoclonal Fab fragments with the desired specificity. (See, e.g., Huse, W.D. et al. (1989) Science 246:1275-1281.)

20 Various immunoassays may be used for screening to identify antibodies having the desired specificity. Numerous protocols for competitive binding or immunoradiometric assays using either polyclonal or monoclonal antibodies with established specificities are well known in the art. Such immunoassays typically involve the measurement of complex formation between HSECP and its specific antibody. A two-site, monoclonal-based immunoassay utilizing monoclonal antibodies reactive to two non-interfering HSECP epitopes is generally used, but a competitive binding assay may also be employed (Pound, *supra*).

Various methods such as Scatchard analysis in conjunction with radioimmunoassay techniques may be used to assess the affinity of antibodies for HSECP. Affinity is expressed as an association constant, K_a , which is defined as the molar concentration of HSECP-antibody complex divided by the molar concentrations of free antigen and free antibody under equilibrium conditions. The K_a determined for a preparation of polyclonal antibodies, which are heterogeneous in their affinities for multiple HSECP epitopes, represents the average affinity, or avidity, of the antibodies for HSECP. The K_a determined for a preparation of monoclonal antibodies, which are monospecific
35 for a particular HSECP epitope, represents a true measure of affinity. High-affinity antibody

preparations with K_a ranging from about 10^9 to 10^{12} L/mole are preferred for use in immunoassays in which the HSECP-antibody complex must withstand rigorous manipulations. Low-affinity antibody preparations with K_a ranging from about 10^6 to 10^7 L/mole are preferred for use in immunopurification and similar procedures which ultimately require dissociation of HSECP,

preferably in active form, from the antibody (Catty, D. (1988) Antibodies, Volume I: A Practical Approach, IRL Press, Washington, DC; Liddell, J.E. and Cryer, A. (1991) A Practical Guide to Monoclonal Antibodies, John Wiley & Sons, New York NY).

The titer and avidity of polyclonal antibody preparations may be further evaluated to determine the quality and suitability of such preparations for certain downstream applications. For example, a polyclonal antibody preparation containing at least 1-2 mg specific antibody/ml, preferably 5-10 mg specific antibody/ml, is generally employed in procedures requiring precipitation of HSECP-antibody complexes. Procedures for evaluating antibody specificity, titer, and avidity, and guidelines for antibody quality and usage in various applications, are generally available. (See, e.g., Catty, supra, and Coligan et al. supra.)

In another embodiment of the invention, the polynucleotides encoding HSECP, or any fragment or complement thereof, may be used for therapeutic purposes. In one aspect, the complement of the polynucleotide encoding HSECP may be used in situations in which it would be desirable to block the transcription of the mRNA. In particular, cells may be transformed with sequences complementary to polynucleotides encoding HSECP. Thus, complementary molecules or fragments may be used to modulate HSECP activity, or to achieve regulation of gene function. Such technology is now well known in the art, and sense or antisense oligonucleotides or larger fragments can be designed from various locations along the coding or control regions of sequences encoding HSECP.

Expression vectors derived from retroviruses, adenoviruses, or herpes or vaccinia viruses, or from various bacterial plasmids, may be used for delivery of nucleotide sequences to the targeted organ, tissue, or cell population. Methods which are well known to those skilled in the art can be used to construct vectors to express nucleic acid sequences complementary to the polynucleotides encoding HSECP. (See, e.g., Sambrook, supra; Ausubel, 1995, supra.)

Genes encoding HSECP can be turned off by transforming a cell or tissue with expression vectors which express high levels of a polynucleotide, or fragment thereof, encoding HSECP. Such constructs may be used to introduce untranslatable sense or antisense sequences into a cell. Even in the absence of integration into the DNA, such vectors may continue to transcribe RNA molecules until they are disabled by endogenous nucleases. Transient expression may last for a month or more with a non-replicating vector, and may last even longer if appropriate replication elements are part of the vector system.

As mentioned above, modifications of gene expression can be obtained by designing complementary sequences or antisense molecules (DNA, RNA, or PNA) to the control, 5', or regulatory regions of the gene encoding HSECP. Oligonucleotides derived from the transcription initiation site, e.g., between about positions -10 and +10 from the start site, may be employed.

- 5 Similarly, inhibition can be achieved using triple helix base-pairing methodology. Triple helix pairing is useful because it causes inhibition of the ability of the double helix to open sufficiently for the binding of polymerases, transcription factors, or regulatory molecules. Recent therapeutic advances using triplex DNA have been described in the literature. (See, e.g., Gee, J.E. et al. (1994) in Huber, B.E. and B.I. Carr, Molecular and Immunologic Approaches, Futura Publishing, Mt. Kisco
10 NY, pp. 163-177.) A complementary sequence or antisense molecule may also be designed to block translation of mRNA by preventing the transcript from binding to ribosomes.

- Ribozymes, enzymatic RNA molecules, may also be used to catalyze the specific cleavage of RNA. The mechanism of ribozyme action involves sequence-specific hybridization of the ribozyme molecule to complementary target RNA, followed by endonucleolytic cleavage. For example,
15 engineered hammerhead motif ribozyme molecules may specifically and efficiently catalyze endonucleolytic cleavage of sequences encoding HSECP.

- Specific ribozyme cleavage sites within any potential RNA target are initially identified by scanning the target molecule for ribozyme cleavage sites, including the following sequences: GUA, GUU, and GUC. Once identified, short RNA sequences of between 15 and 20 ribonucleotides,
20 corresponding to the region of the target gene containing the cleavage site, may be evaluated for secondary structural features which may render the oligonucleotide inoperable. The suitability of candidate targets may also be evaluated by testing accessibility to hybridization with complementary oligonucleotides using ribonuclease protection assays.

- Complementary ribonucleic acid molecules and ribozymes of the invention may be prepared
25 by any method known in the art for the synthesis of nucleic acid molecules. These include techniques for chemically synthesizing oligonucleotides such as solid phase phosphoramidite chemical synthesis. Alternatively, RNA molecules may be generated by in vitro and in vivo transcription of DNA sequences encoding HSECP. Such DNA sequences may be incorporated into a wide variety of vectors with suitable RNA polymerase promoters such as T7 or SP6. Alternatively, these cDNA
30 constructs that synthesize complementary RNA, constitutively or inducibly, can be introduced into cell lines, cells, or tissues.

- RNA molecules may be modified to increase intracellular stability and half-life. Possible modifications include, but are not limited to, the addition of flanking sequences at the 5' and/or 3' ends of the molecule, or the use of phosphorothioate or 2' O-methyl rather than phosphodiesterase
35 linkages within the backbone of the molecule. This concept is inherent in the production of PNAs

and can be extended in all of these molecules by the inclusion of nontraditional bases such as inosine, queosine, and wybutosine, as well as acetyl-, methyl-, thio-, and similarly modified forms of adenine, cytidine, guanine, thymine, and uridine which are not as easily recognized by endogenous endonucleases.

5 Many methods for introducing vectors into cells or tissues are available and equally suitable for use in vivo, in vitro, and ex vivo. For ex vivo therapy, vectors may be introduced into stem cells taken from the patient and clonally propagated for autologous transplant back into that same patient. Delivery by transfection, by liposome injections, or by polycationic amino polymers may be achieved using methods which are well known in the art. (See, e.g., Goldman, C.K. et al. (1997) Nat. Biotechnol. 15:462-466.)

Any of the therapeutic methods described above may be applied to any subject in need of such therapy, including, for example, mammals such as humans, dogs, cats, cows, horses, rabbits, and monkeys.

15 An additional embodiment of the invention relates to the administration of a pharmaceutical or sterile composition, in conjunction with a pharmaceutically acceptable carrier, for any of the therapeutic effects discussed above. Such pharmaceutical compositions may consist of HSECP, antibodies to HSECP, and mimetics, agonists, antagonists, or inhibitors of HSECP. The compositions may be administered alone or in combination with at least one other agent, such as a stabilizing compound, which may be administered in any sterile, biocompatible pharmaceutical carrier including, 20 but not limited to, saline, buffered saline, dextrose, and water. The compositions may be administered to a patient alone, or in combination with other agents, drugs, or hormones.

The pharmaceutical compositions utilized in this invention may be administered by any number of routes including, but not limited to, oral, intravenous, intramuscular, intra-arterial, intramedullary, intrathecal, intraventricular, transdermal, subcutaneous, intraperitoneal, intranasal, 25 enteral, topical, sublingual, or rectal means.

In addition to the active ingredients, these pharmaceutical compositions may contain suitable pharmaceutically-acceptable carriers comprising excipients and auxiliaries which facilitate processing of the active compounds into preparations which can be used pharmaceutically. Further details on techniques for formulation and administration may be found in the latest edition of Remington's 30 Pharmaceutical Sciences (Maack Publishing, Easton PA).

Pharmaceutical compositions for oral administration can be formulated using pharmaceutically acceptable carriers well known in the art in dosages suitable for oral administration. Such carriers enable the pharmaceutical compositions to be formulated as tablets, pills, dragees, capsules, liquids, gels, syrups, slurries, suspensions, and the like, for ingestion by the patient.

35 Pharmaceutical preparations for oral use can be obtained through combining active

compounds with solid excipient and processing the resultant mixture of granules (optionally, after grinding) to obtain tablets or dragee cores. Suitable auxiliaries can be added, if desired. Suitable excipients include carbohydrate or protein fillers, such as sugars, including lactose, sucrose, mannitol, and sorbitol; starch from corn, wheat, rice, potato, or other plants; cellulose, such as methyl cellulose, hydroxypropylmethyl-cellulose, or sodium carboxymethylcellulose; gums, including arabic and tragacanth; and proteins, such as gelatin and collagen. If desired, disintegrating or solubilizing agents may be added, such as the cross-linked polyvinyl pyrrolidone, agar, and alginic acid or a salt thereof, such as sodium alginate.

Dragee cores may be used in conjunction with suitable coatings, such as concentrated sugar solutions, which may also contain gum arabic, talc, polyvinylpyrrolidone, carbopol gel, polyethylene glycol, and/or titanium dioxide, lacquer solutions, and suitable organic solvents or solvent mixtures. Dyestuffs or pigments may be added to the tablets or dragee coatings for product identification or to characterize the quantity of active compound, i.e., dosage.

Pharmaceutical preparations which can be used orally include push-fit capsules made of gelatin, as well as soft, sealed capsules made of gelatin and a coating, such as glycerol or sorbitol. Push-fit capsules can contain active ingredients mixed with fillers or binders, such as lactose or starches, lubricants, such as talc or magnesium stearate, and, optionally, stabilizers. In soft capsules, the active compounds may be dissolved or suspended in suitable liquids, such as fatty oils, liquid, or liquid polyethylene glycol with or without stabilizers.

Pharmaceutical formulations suitable for parenteral administration may be formulated in aqueous solutions, preferably in physiologically compatible buffers such as Hanks' solution, Ringer's solution, or physiologically buffered saline. Aqueous injection suspensions may contain substances which increase the viscosity of the suspension, such as sodium carboxymethyl cellulose, sorbitol, or dextran. Additionally, suspensions of the active compounds may be prepared as appropriate oily injection suspensions. Suitable lipophilic solvents or vehicles include fatty oils, such as sesame oil, or synthetic fatty acid esters, such as ethyl oleate, triglycerides, or liposomes. Non-lipid polycationic amino polymers may also be used for delivery. Optionally, the suspension may also contain suitable stabilizers or agents to increase the solubility of the compounds and allow for the preparation of highly concentrated solutions.

For topical or nasal administration, penetrants appropriate to the particular barrier to be permeated are used in the formulation. Such penetrants are generally known in the art.

The pharmaceutical compositions of the present invention may be manufactured in a manner that is known in the art, e.g., by means of conventional mixing, dissolving, granulating, dragee-making, levigating, emulsifying, encapsulating, entrapping, or lyophilizing processes.

The pharmaceutical composition may be provided as a salt and can be formed with many

acids, including but not limited to, hydrochloric, sulfuric, acetic, lactic, tartaric, malic, and succinic acids. Salts tend to be more soluble in aqueous or other protonic solvents than are the corresponding free base forms. In other cases, the preparation may be a lyophilized powder which may contain any or all of the following: 1 mM to 50 mM histidine, 0.1% to 2% sucrose, and 2% to 7% mannitol, at a pH range of 4.5 to 5.5, that is combined with buffer prior to use.

After pharmaceutical compositions have been prepared, they can be placed in an appropriate container and labeled for treatment of an indicated condition. For administration of HSECP, such labeling would include amount, frequency, and method of administration.

Pharmaceutical compositions suitable for use in the invention include compositions wherein the active ingredients are contained in an effective amount to achieve the intended purpose. The determination of an effective dose is well within the capability of those skilled in the art.

For any compound, the therapeutically effective dose can be estimated initially either in cell culture assays, e.g., of neoplastic cells, or in animal models such as mice, rats, rabbits, dogs, or pigs. An animal model may also be used to determine the appropriate concentration range and route of administration. Such information can then be used to determine useful doses and routes for administration in humans.

A therapeutically effective dose refers to that amount of active ingredient, for example HSECP or fragments thereof, antibodies of HSECP, and agonists, antagonists or inhibitors of HSECP, which ameliorates the symptoms or condition. Therapeutic efficacy and toxicity may be determined by standard pharmaceutical procedures in cell cultures or with experimental animals, such as by calculating the ED_{50} (the dose therapeutically effective in 50% of the population) or LD_{50} (the dose lethal to 50% of the population) statistics. The dose ratio of toxic to therapeutic effects is the therapeutic index, which can be expressed as the LD_{50}/ED_{50} ratio. Pharmaceutical compositions which exhibit large therapeutic indices are preferred. The data obtained from cell culture assays and animal studies are used to formulate a range of dosage for human use. The dosage contained in such compositions is preferably within a range of circulating concentrations that includes the ED_{50} with little or no toxicity. The dosage varies within this range depending upon the dosage form employed, the sensitivity of the patient, and the route of administration.

The exact dosage will be determined by the practitioner, in light of factors related to the subject requiring treatment. Dosage and administration are adjusted to provide sufficient levels of the active moiety or to maintain the desired effect. Factors which may be taken into account include the severity of the disease state, the general health of the subject, the age, weight, and gender of the subject, time and frequency of administration, drug combination(s), reaction sensitivities, and response to therapy. Long-acting pharmaceutical compositions may be administered every 3 to 4 days, every week, or biweekly depending on the half-life and clearance rate of the particular

formulation.

Normal dosage amounts may vary from about 0.1 μg to 100,000 μg , up to a total dose of about 1 gram, depending upon the route of administration. Guidance as to particular dosages and methods of delivery is provided in the literature and generally available to practitioners in the art.

- 5 Those skilled in the art will employ different formulations for nucleotides than for proteins or their inhibitors. Similarly, delivery of polynucleotides or polypeptides will be specific to particular cells, conditions, locations, etc.

DIAGNOSTICS

- 10 In another embodiment, antibodies which specifically bind HSECP may be used for the diagnosis of disorders characterized by expression of HSECP, or in assays to monitor patients being treated with HSECP or agonists, antagonists, or inhibitors of HSECP. Antibodies useful for diagnostic purposes may be prepared in the same manner as described above for therapeutics. Diagnostic assays for HSECP include methods which utilize the antibody and a label to detect HSECP in human body fluids or in extracts of cells or tissues. The antibodies may be used with or
- 15 without modification, and may be labeled by covalent or non-covalent attachment of a reporter molecule. A wide variety of reporter molecules, several of which are described above, are known in the art and may be used.

- A variety of protocols for measuring HSECP, including ELISAs, RIAs, and FACS, are known in the art and provide a basis for diagnosing altered or abnormal levels of HSECP expression.
- 20 Normal or standard values for HSECP expression are established by combining body fluids or cell extracts taken from normal mammalian subjects, for example, human subjects, with antibody to HSECP under conditions suitable for complex formation. The amount of standard complex formation may be quantitated by various methods, such as photometric means. Quantities of HSECP expressed in subject, control, and disease samples from biopsied tissues are compared with the standard values.
- 25 Deviation between standard and subject values establishes the parameters for diagnosing disease.

- In another embodiment of the invention, the polynucleotides encoding HSECP may be used for diagnostic purposes. The polynucleotides which may be used include oligonucleotide sequences, complementary RNA and DNA molecules, and PNAs. The polynucleotides may be used to detect and quantify gene expression in biopsied tissues in which expression of HSECP may be correlated
- 30 with disease. The diagnostic assay may be used to determine absence, presence, and excess expression of HSECP, and to monitor regulation of HSECP levels during therapeutic intervention.

- In one aspect, hybridization with PCR probes which are capable of detecting polynucleotide sequences, including genomic sequences, encoding HSECP or closely related molecules may be used to identify nucleic acid sequences which encode HSECP. The specificity of the probe, whether it is
- 35 made from a highly specific region, e.g., the 5' regulatory region, or from a less specific region, e.g., a

conserved motif, and the stringency of the hybridization or amplification will determine whether the probe identifies only naturally occurring sequences encoding HSECP, allelic variants, or related sequences.

Probes may also be used for the detection of related sequences, and may have at least 50% sequence identity to any of the HSECP encoding sequences. The hybridization probes of the subject invention may be DNA or RNA and may be derived from the sequence of SEQ ID NO:23-44 or from genomic sequences including promoters, enhancers, and introns of the HSECP gene.

Means for producing specific hybridization probes for DNAs encoding HSECP include the cloning of polynucleotide sequences encoding HSECP or HSECP derivatives into vectors for the production of mRNA probes. Such vectors are known in the art, are commercially available, and may be used to synthesize RNA probes *in vitro* by means of the addition of the appropriate RNA polymerases and the appropriate labeled nucleotides. Hybridization probes may be labeled by a variety of reporter groups, for example, by radionuclides such as ^{32}P or ^{35}S , or by enzymatic labels, such as alkaline phosphatase coupled to the probe via avidin/biotin coupling systems, and the like.

Polynucleotide sequences encoding HSECP may be used for the diagnosis of disorders associated with expression of HSECP. Examples of such disorders include, but are not limited to, a cancer such as adenocarcinoma, leukemia, lymphoma, melanoma, myeloma, sarcoma, teratocarcinoma, and, in particular, cancers of the adrenal gland, bladder, bone, bone marrow, brain, breast, cervix, gall bladder, ganglia, gastrointestinal tract, heart, kidney, liver, lung, muscle, ovary, pancreas, parathyroid, penis, prostate, salivary glands, skin, spleen, testis, thymus, thyroid, and uterus; an inflammatory disorder such as acquired immunodeficiency syndrome (AIDS), Addison's disease, adult respiratory distress syndrome, allergies, ankylosing spondylitis, amyloidosis, anemia, asthma, atherosclerosis, autoimmune hemolytic anemia, autoimmune thyroiditis, autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED), bronchitis, cholecystitis, contact dermatitis, Crohn's disease, atopic dermatitis, dermatomyositis, diabetes mellitus, emphysema, episodic lymphopenia with lymphocytotoxins, erythroblastosis fetalis, erythema nodosum, atrophic gastritis, glomerulonephritis, Goodpasture's syndrome, gout, Graves' disease, Hashimoto's thyroiditis, hypereosinophilia, irritable bowel syndrome, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, psoriasis, Reiter's syndrome, rheumatoid arthritis, scleroderma, Sjögren's syndrome, systemic anaphylaxis, systemic lupus erythematosus, systemic sclerosis, thrombocytopenic purpura, ulcerative colitis, uveitis, Werner syndrome, complications of cancer, hemodialysis, and extracorporeal circulation, viral, bacterial, fungal, parasitic, protozoal, and helminthic infections, and trauma; a gastrointestinal disorder such as dysphagia, peptic esophagitis, esophageal spasm, esophageal stricture, esophageal carcinoma, dyspepsia, indigestion, gastritis, gastric carcinoma, anorexia, nausea,

emesis, gastroparesis, antral or pyloric edema, abdominal angina, pyrosis, gastroenteritis, intestinal obstruction, infections of the intestinal tract, peptic ulcer, cholelithiasis, cholecystitis, cholestasis, pancreatitis, pancreatic carcinoma, biliary tract disease, hepatitis, hyperbilirubinemia, cirrhosis, passive congestion of the liver, hepatoma, infectious colitis, ulcerative colitis, ulcerative proctitis,

5 Crohn's disease, Whipple's disease, Mallory-Weiss syndrome, colonic carcinoma, colonic obstruction, irritable bowel syndrome, short bowel syndrome, diarrhea, constipation, gastrointestinal hemorrhage, acquired immunodeficiency syndrome (AIDS) enteropathy, jaundice, hepatic encephalopathy, hepatorenal syndrome, hepatic steatosis, hemochromatosis, Wilson's disease, alpha₁-antitrypsin deficiency, Reye's syndrome, primary sclerosing cholangitis, liver infarction, portal vein

10 obstruction and thrombosis, centrilobular necrosis, peliosis hepatis, hepatic vein thrombosis, veno-occlusive disease, preeclampsia, eclampsia, acute fatty liver of pregnancy, intrahepatic cholestasis of pregnancy, and hepatic tumors including nodular hyperplasias, adenomas, and carcinomas; a cardiovascular disorder, and in particular, a disorder of the heart such as congestive heart failure, ischemic heart disease, angina pectoris, myocardial infarction, hypertensive heart disease,

15 degenerative valvular heart disease, calcific aortic valve stenosis, congenitally bicuspid aortic valve, mitral annular calcification, mitral valve prolapse, rheumatic fever and rheumatic heart disease, infective endocarditis, nonbacterial thrombotic endocarditis, endocarditis of systemic lupus erythematosus, carcinoid heart disease, cardiomyopathy, myocarditis, pericarditis, neoplastic heart disease, congenital heart disease, and complications of cardiac transplantation; and a neurological

20 disorder such as epilepsy, ischemic cerebrovascular disease, stroke, cerebral neoplasms, Alzheimer's disease, Pick's disease, Huntington's disease, dementia, Parkinson's disease and other extrapyramidal disorders, amyotrophic lateral sclerosis and other motor neuron disorders, progressive neural muscular atrophy, retinitis pigmentosa, hereditary ataxias, multiple sclerosis and other demyelinating diseases, bacterial and viral meningitis, brain abscess, subdural empyema, epidural abscess,

25 suppurative intracranial thrombophlebitis, myelitis and radiculitis, viral central nervous system disease, prion diseases including kuru, Creutzfeldt-Jakob disease, and Gerstmann-Straussler-Scheinker syndrome, fatal familial insomnia, nutritional and metabolic diseases of the nervous system, neurofibromatosis, tuberous sclerosis, cerebelloretinal hemangioblastomatosis, encephalotrigeminal syndrome, mental retardation and other developmental disorders of the central

30 nervous system, cerebral palsy, neuroskeletal disorders, autonomic nervous system disorders, cranial nerve disorders, spinal cord diseases, muscular dystrophy and other neuromuscular disorders, peripheral nervous system disorders, dermatomyositis and polymyositis, inherited, metabolic, endocrine, and toxic myopathies, myasthenia gravis, periodic paralysis, mental disorders including mood, anxiety, and schizophrenic disorders, seasonal affective disorder (SAD), akathisia, amnesia,

35 catatonia, diabetic neuropathy, tardive dyskinesia, dystonias, paranoid psychoses, postherpetic

neuralgia, and Tourette's disorder. The polynucleotide sequences encoding HSECP may be used in Southern or northern analysis, dot blot, or other membrane-based technologies; in PCR technologies; in dipstick, pin, and multiformat ELISA-like assays; and in microarrays utilizing fluids or tissues from patients to detect altered HSECP expression. Such qualitative or quantitative methods are well known in the art.

In a particular aspect, the nucleotide sequences encoding HSECP may be useful in assays that detect the presence of associated disorders, particularly those mentioned above. The nucleotide sequences encoding HSECP may be labeled by standard methods and added to a fluid or tissue sample from a patient under conditions suitable for the formation of hybridization complexes. After a suitable incubation period, the sample is washed and the signal is quantified and compared with a standard value. If the amount of signal in the patient sample is significantly altered in comparison to a control sample then the presence of altered levels of nucleotide sequences encoding HSECP in the sample indicates the presence of the associated disorder. Such assays may also be used to evaluate the efficacy of a particular therapeutic treatment regimen in animal studies, in clinical trials, or to monitor the treatment of an individual patient.

In order to provide a basis for the diagnosis of a disorder associated with expression of HSECP, a normal or standard profile for expression is established. This may be accomplished by combining body fluids or cell extracts taken from normal subjects, either animal or human, with a sequence, or a fragment thereof, encoding HSECP, under conditions suitable for hybridization or amplification. Standard hybridization may be quantified by comparing the values obtained from normal subjects with values from an experiment in which a known amount of a substantially purified polynucleotide is used. Standard values obtained in this manner may be compared with values obtained from samples from patients who are symptomatic for a disorder. Deviation from standard values is used to establish the presence of a disorder.

Once the presence of a disorder is established and a treatment protocol is initiated, hybridization assays may be repeated on a regular basis to determine if the level of expression in the patient begins to approximate that which is observed in the normal subject. The results obtained from successive assays may be used to show the efficacy of treatment over a period ranging from several days to months.

With respect to cancer, the presence of an abnormal amount of transcript (either under- or overexpressed) in biopsied tissue from an individual may indicate a predisposition for the development of the disease, or may provide a means for detecting the disease prior to the appearance of actual clinical symptoms. A more definitive diagnosis of this type may allow health professionals to employ preventative measures or aggressive treatment earlier thereby preventing the development or further progression of the cancer.

Additional diagnostic uses for oligonucleotides designed from the sequences encoding HSECP may involve the use of PCR. These oligomers may be chemically synthesized, generated enzymatically, or produced in vitro. Oligomers will preferably contain a fragment of a polynucleotide encoding HSECP, or a fragment of a polynucleotide complementary to the polynucleotide encoding HSECP, and will be employed under optimized conditions for identification of a specific gene or condition. Oligomers may also be employed under less stringent conditions for detection or quantification of closely related DNA or RNA sequences.

Methods which may also be used to quantify the expression of HSECP include radiolabeling or biotinylating nucleotides, coamplification of a control nucleic acid, and interpolating results from standard curves. (See, e.g., Melby, P.C. et al. (1993) *J. Immunol. Methods* 159:235-244; Duplaa, C. et al. (1993) *Anal. Biochem.* 212:229-236.) The speed of quantitation of multiple samples may be accelerated by running the assay in a high-throughput format where the oligomer of interest is presented in various dilutions and a spectrophotometric or colorimetric response gives rapid quantitation.

In further embodiments, oligonucleotides or longer fragments derived from any of the polynucleotide sequences described herein may be used as targets in a microarray. The microarray can be used to monitor the expression level of large numbers of genes simultaneously and to identify genetic variants, mutations, and polymorphisms. This information may be used to determine gene function, to understand the genetic basis of a disorder, to diagnose a disorder, and to develop and monitor the activities of therapeutic agents.

Microarrays may be prepared, used, and analyzed using methods known in the art. (See, e.g., Brennan, T.M. et al. (1995) U.S. Patent No. 5,474,796; Schena, M. et al. (1996) *Proc. Natl. Acad. Sci. USA* 93:10614-10619; Baldeschweiler et al. (1995) PCT application WO95/251116; Shalon, D. et al. (1995) PCT application WO95/35505; Heller, R.A. et al. (1997) *Proc. Natl. Acad. Sci. USA* 94:2150-2155; and Heller, M.J. et al. (1997) U.S. Patent No. 5,605,662.)

In another embodiment of the invention, nucleic acid sequences encoding HSECP may be used to generate hybridization probes useful in mapping the naturally occurring genomic sequence. The sequences may be mapped to a particular chromosome, to a specific region of a chromosome, or to artificial chromosome constructions, e.g., human artificial chromosomes (HACs), yeast artificial chromosomes (YACs), bacterial artificial chromosomes (BACs), bacterial P1 constructions, or single chromosome cDNA libraries. (See, e.g., Harrington, J.J. et al. (1997) *Nat. Genet.* 15:345-355; Price, C.M. (1993) *Blood Rev.* 7:127-134; and Trask, B.J. (1991) *Trends Genet.* 7:149-154.)

Fluorescent in situ hybridization (FISH) may be correlated with other physical chromosome mapping techniques and genetic map data. (See, e.g., Heinz-Ulrich, et al. (1995) in Meyers, supra, pp. 965-968.) Examples of genetic map data can be found in various scientific journals or at the

Online Mendelian Inheritance in Man (OMIM) World Wide Web site. Correlation between the location of the gene encoding HSECP on a physical chromosomal map and a specific disorder, or a predisposition to a specific disorder, may help define the region of DNA associated with that disorder. The nucleotide sequences of the invention may be used to detect differences in gene

5 sequences among normal, carrier, and affected individuals.

In situ hybridization of chromosomal preparations and physical mapping techniques, such as linkage analysis using established chromosomal markers, may be used for extending genetic maps. Often the placement of a gene on the chromosome of another mammalian species, such as mouse, may reveal associated markers even if the number or arm of a particular human chromosome is not
10 known. New sequences can be assigned to chromosomal arms by physical mapping. This provides valuable information to investigators searching for disease genes using positional cloning or other gene discovery techniques. Once the disease or syndrome has been crudely localized by genetic linkage to a particular genomic region, e.g., ataxia-telangiectasia to 11q22-23, any sequences mapping to that area may represent associated or regulatory genes for further investigation. (See, e.g., Gatti,
15 R.A. et al. (1988) Nature 336:577-580.) The nucleotide sequence of the subject invention may also be used to detect differences in the chromosomal location due to translocation, inversion, etc., among normal, carrier, or affected individuals.

In another embodiment of the invention, HSECP, its catalytic or immunogenic fragments, or oligopeptides thereof can be used for screening libraries of compounds in any of a variety of drug
20 screening techniques. The fragment employed in such screening may be free in solution, affixed to a solid support, borne on a cell surface, or located intracellularly. The formation of binding complexes between HSECP and the agent being tested may be measured.

Another technique for drug screening provides for high throughput screening of compounds having suitable binding affinity to the protein of interest. (See, e.g., Geysen, et al. (1984) PCT
25 application WO84/03564.) In this method, large numbers of different small test compounds are synthesized on a solid substrate. The test compounds are reacted with HSECP, or fragments thereof, and washed. Bound HSECP is then detected by methods well known in the art. Purified HSECP can also be coated directly onto plates for use in the aforementioned drug screening techniques. Alternatively, non-neutralizing antibodies can be used to capture the peptide and immobilize it on a
30 solid support.

In another embodiment, one may use competitive drug screening assays in which neutralizing antibodies capable of binding HSECP specifically compete with a test compound for binding HSECP. In this manner, antibodies can be used to detect the presence of any peptide which shares one or more antigenic determinants with HSECP.

35 In additional embodiments, the nucleotide sequences which encode HSECP may be used in

any molecular biology techniques that have yet to be developed, provided the new techniques rely on properties of nucleotide sequences that are currently known, including, but not limited to, such properties as the triplet genetic code and specific base pair interactions.

Without further elaboration, it is believed that one skilled in the art can, using the preceding description, utilize the present invention to its fullest extent. The following preferred specific
5 embodiments are, therefore, to be construed as merely illustrative, and not limitative of the remainder of the disclosure in any way whatsoever.

Without further elaboration, it is believed that one skilled in the art can, using the preceding description, utilize the present invention to its fullest extent. The following preferred specific
10 embodiments are, therefore, to be construed as merely illustrative, and not limitative of the remainder of the disclosure in any way whatsoever.

The disclosures of all patents, applications, and publications mentioned above and below, in particular U.S. Ser. No. 60/123,117, are hereby expressly incorporated by reference.

15 EXAMPLES

I. Construction of cDNA Libraries

RNA was purchased from Clontech or isolated from tissues described in Table 4. Some tissues were homogenized and lysed in guanidinium isothiocyanate, while others were homogenized and lysed in phenol or in a suitable mixture of denaturants, such as TRIZOL (Life Technologies), a
20 monophasic solution of phenol and guanidine isothiocyanate. The resulting lysates were centrifuged over CsCl cushions or extracted with chloroform. RNA was precipitated from the lysates with either isopropanol or sodium acetate and ethanol, or by other routine methods.

Phenol extraction and precipitation of RNA were repeated as necessary to increase RNA purity. In some cases, RNA was treated with DNase. For most libraries, poly(A+) RNA was isolated
25 using oligo d(T)-coupled paramagnetic particles (Promega), OLIGOTEX latex particles (QIAGEN, Chatsworth CA), or an OLIGOTEX mRNA purification kit (QIAGEN). Alternatively, RNA was isolated directly from tissue lysates using other RNA isolation kits, e.g., the POLY(A)PURE mRNA purification kit (Ambion, Austin TX).

In some cases, Stratagene was provided with RNA and constructed the corresponding cDNA
30 libraries. Otherwise, cDNA was synthesized and cDNA libraries were constructed with the UNIZAP vector system (Stratagene) or SUPERScript plasmid system (Life Technologies), using the recommended procedures or similar methods known in the art. (See, e.g., Ausubel, 1997, supra, units 5.1-6.6.) Reverse transcription was initiated using oligo d(T) or random primers. Synthetic oligonucleotide adapters were ligated to double stranded cDNA, and the cDNA was digested with the
35 appropriate restriction enzyme or enzymes. For most libraries, the cDNA was size-selected (300-

1000 bp) using SEPHACRYL S1000, SEPHAROSE CL2B, or SEPHAROSE CL4B column chromatography (Amersham Pharmacia Biotech) or preparative agarose gel electrophoresis. cDNAs were ligated into compatible restriction enzyme sites of the polylinker of a suitable plasmid, e.g., PBLUESCRIPT plasmid (Stratagene), PSPO1 plasmid (Life Technologies), pcDNA2.1 plasmid (Invitrogen, Carlsbad CA), or pINCY plasmid (Incyte Pharmaceuticals, Palo Alto CA). Recombinant plasmids were transformed into competent *E. coli* cells including XL1-Blue, XL1-BlueMRF, or SOLR from Stratagene or DH5 α , DH10B, or ElectroMAX DH10B from Life Technologies.

II. Isolation of cDNA Clones

Plasmids were recovered from host cells by in vivo excision using the UNIZAP vector system (Stratagene) or by cell lysis. Plasmids were purified using at least one of the following: a Magic or WIZARD Minipreps DNA purification system (Promega); an AGTC Miniprep purification kit (Edge Biosystems, Gaithersburg MD); and QIAWELL 8 Plasmid, QIAWELL 8 Plus Plasmid, QIAWELL 8 Ultra Plasmid purification systems or the R.E.A.L. PREP 96 plasmid purification kit from QIAGEN. Following precipitation, plasmids were resuspended in 0.1 ml of distilled water and stored, with or without lyophilization, at 4°C.

Alternatively, plasmid DNA was amplified from host cell lysates using direct link PCR in a high-throughput format (Rao, V.B. (1994) Anal. Biochem. 216:1-14). Host cell lysis and thermal cycling steps were carried out in a single reaction mixture. Samples were processed and stored in 384-well plates, and the concentration of amplified plasmid DNA was quantified fluorometrically using PICOGREEN dye (Molecular Probes, Eugene OR) and a FLUOROSKAN II fluorescence scanner (Labsystems Oy, Helsinki, Finland).

III. Sequencing and Analysis

cDNA sequencing reactions were processed using standard methods or high-throughput instrumentation such as the ABI CATALYST 800 (Perkin-Elmer) thermal cycler or the PTC-200 thermal cycler (MJ Research) in conjunction with the HYDRA microdispenser (Robbins Scientific) or the MICROLAB 2200 (Hamilton) liquid transfer system. cDNA sequencing reactions were prepared using reagents provided by Amersham Pharmacia Biotech or supplied in ABI sequencing kits such as the ABI PRISM BIGDYE Terminator cycle sequencing ready reaction kit (Perkin-Elmer). Electrophoretic separation of cDNA sequencing reactions and detection of labeled polynucleotides were carried out using the MEGABACE 1000 DNA sequencing system (Molecular Dynamics); the ABI PRISM 373 or 377 sequencing system (Perkin-Elmer) in conjunction with standard ABI protocols and base calling software; or other sequence analysis systems known in the art. Reading frames within the cDNA sequences were identified using standard methods (reviewed in Ausubel, 1997, supra, unit 7.7). Some of the cDNA sequences were selected for extension using the techniques disclosed in Example V.

The polynucleotide sequences derived from cDNA sequencing were assembled and analyzed using a combination of software programs which utilize algorithms well known to those skilled in the art. Table 5 summarizes the tools, programs, and algorithms used and provides applicable descriptions, references, and threshold parameters. The first column of Table 5 shows the tools, programs, and algorithms used, the second column provides brief descriptions thereof, the third column presents appropriate references, all of which are incorporated by reference herein in their entirety, and the fourth column presents, where applicable, the scores, probability values, and other parameters used to evaluate the strength of a match between two sequences (the higher the score, the greater the homology between two sequences). Sequences were analyzed using MACDNASIS PRO software (Hitachi Software Engineering, South San Francisco CA) and LASERGENE software (DNASTAR). Polynucleotide and polypeptide sequence alignments were generated using the default parameters specified by the clustal algorithm as incorporated into the MEGALIGN multisequence alignment program (DNASTAR), which also calculates the percent identity between aligned sequences.

The polynucleotide sequences were validated by removing vector, linker, and polyA sequences and by masking ambiguous bases, using algorithms and programs based on BLAST, dynamic programming, and dinucleotide nearest neighbor analysis. The sequences were then queried against a selection of public databases such as the GenBank primate, rodent, mammalian, vertebrate, and eukaryote databases, and BLOCKS, PRINTS, DOMO, PRODOM, and PFAM to acquire annotation using programs based on BLAST, FASTA, and BLIMPS. The sequences were assembled into full length polynucleotide sequences using programs based on Phred, Phrap, and Consed, and were screened for open reading frames using programs based on GeneMark, BLAST, and FASTA. The full length polynucleotide sequences were translated to derive the corresponding full length amino acid sequences, and these full length sequences were subsequently analyzed by querying against databases such as the GenBank databases (described above), SwissProt, BLOCKS, PRINTS, DOMO, PRODOM, Prosite, and Hidden Markov Model (HMM)-based protein family databases such as PFAM. HMM is a probabilistic approach which analyzes consensus primary structures of gene families. (See, e.g., Eddy, S.R. (1996) Curr. Opin. Struct. Biol. 6:361-365.)

The programs described above for the assembly and analysis of full length polynucleotide and amino acid sequences were also used to identify polynucleotide sequence fragments from SEQ ID NO:23-44. Fragments from about 20 to about 4000 nucleotides which are useful in hybridization and amplification technologies were described in The Invention section above.

IV. Northern Analysis

Northern analysis is a laboratory technique used to detect the presence of a transcript of a gene and involves the hybridization of a labeled nucleotide sequence to a membrane on which RNAs

from a particular cell type or tissue have been bound. (See, e.g., Sambrook, supra, ch. 7; Ausubel, 1995, supra, ch. 4 and 16.)

Analogous computer techniques applying BLAST were used to search for identical or related molecules in nucleotide databases such as GenBank or LIFESEQ (Incyte Pharmaceuticals). This analysis is much faster than multiple membrane-based hybridizations. In addition, the sensitivity of the computer search can be modified to determine whether any particular match is categorized as exact or similar. The basis of the search is the product score, which is defined as:

$$\frac{\% \text{ sequence identity} \times \% \text{ maximum BLAST score}}{100}$$

100

The product score takes into account both the degree of similarity between two sequences and the length of the sequence match. For example, with a product score of 40, the match will be exact within a 1% to 2% error, and, with a product score of 70, the match will be exact. Similar molecules are usually identified by selecting those which show product scores between 15 and 40, although lower scores may identify related molecules.

The results of northern analyses are reported as a percentage distribution of libraries in which the transcript encoding HSECP occurred. Analysis involved the categorization of cDNA libraries by organ/tissue and disease. The organ/tissue categories included cardiovascular, dermatologic, developmental, endocrine, gastrointestinal, hematopoietic/immune, musculoskeletal, nervous, reproductive, and urologic. The disease/condition categories included cancer, inflammation, trauma, cell proliferation, neurological, and pooled. For each category, the number of libraries expressing the sequence of interest was counted and divided by the total number of libraries across all categories. Percentage values of tissue-specific and disease- or condition-specific expression are reported in Table 3.

V. Extension of HSECP Encoding Polynucleotides

The full length nucleic acid sequences of SEQ ID NO:23-44 were produced by extension of an appropriate fragment of the full length molecule using oligonucleotide primers designed from this fragment. One primer was synthesized to initiate 5' extension of the known fragment, and the other primer, to initiate 3' extension of the known fragment. The initial primers were designed using OLIGO 4.06 software (National Biosciences), or another appropriate program, to be about 22 to 30 nucleotides in length, to have a GC content of about 50% or more, and to anneal to the target sequence at temperatures of about 68°C to about 72°C. Any stretch of nucleotides which would result in hairpin structures and primer-primer dimerizations was avoided.

Selected human cDNA libraries were used to extend the sequence. If more than one extension was necessary or desired, additional or nested sets of primers were designed.

High fidelity amplification was obtained by PCR using methods well known in the art. PCR

was performed in 96-well plates using the PTC-200 thermal cycler (MJ Research, Inc.). The reaction mix contained DNA template, 200 nmol of each primer, reaction buffer containing Mg^{2+} , $(NH_4)_2SO_4$, and β -mercaptoethanol, Taq DNA polymerase (Amersham Pharmacia Biotech), ELONGASE enzyme (Life Technologies), and Pfu DNA polymerase (Stratagene), with the following parameters for primer pair PCI A and PCI B: Step 1: 94°C, 3 min; Step 2: 94°C, 15 sec; Step 3: 60°C, 1 min; Step 4: 68°C, 2 min; Step 5: Steps 2, 3, and 4 repeated 20 times; Step 6: 68°C, 5 min; Step 7: storage at 4°C. In the alternative, the parameters for primer pair T7 and SK+ were as follows: Step 1: 94°C, 3 min; Step 2: 94°C, 15 sec; Step 3: 57°C, 1 min; Step 4: 68°C, 2 min; Step 5: Steps 2, 3, and 4 repeated 20 times; Step 6: 68°C, 5 min; Step 7: storage at 4°C.

The concentration of DNA in each well was determined by dispensing 100 μ l PICOGREEN quantitation reagent (0.25% (v/v) PICOGREEN; Molecular Probes, Eugene OR) dissolved in 1X TE and 0.5 μ l of undiluted PCR product into each well of an opaque fluorimeter plate (Corning Costar, Acton MA), allowing the DNA to bind to the reagent. The plate was scanned in a Fluoroskan II (Labsystems Oy, Helsinki, Finland) to measure the fluorescence of the sample and to quantify the concentration of DNA. A 5 μ l to 10 μ l aliquot of the reaction mixture was analyzed by electrophoresis on a 1 % agarose mini-gel to determine which reactions were successful in extending the sequence.

The extended nucleotides were desalted and concentrated, transferred to 384-well plates, digested with CviII cholera virus endonuclease (Molecular Biology Research, Madison WI), and sonicated or sheared prior to religation into pUC 18 vector (Amersham Pharmacia Biotech). For shotgun sequencing, the digested nucleotides were separated on low concentration (0.6 to 0.8%) agarose gels, fragments were excised, and agar digested with Agar ACE (Promega). Extended clones were religated using T4 ligase (New England Biolabs, Beverly MA) into pUC 18 vector (Amersham Pharmacia Biotech), treated with Pfu DNA polymerase (Stratagene) to fill-in restriction site overhangs, and transfected into competent *E. coli* cells. Transformed cells were selected on antibiotic-containing media, individual colonies were picked and cultured overnight at 37°C in 384-well plates in LB/2x carb liquid media.

The cells were lysed, and DNA was amplified by PCR using Taq DNA polymerase (Amersham Pharmacia Biotech) and Pfu DNA polymerase (Stratagene) with the following parameters: Step 1: 94°C, 3 min; Step 2: 94°C, 15 sec; Step 3: 60°C, 1 min; Step 4: 72°C, 2 min; Step 5: steps 2, 3, and 4 repeated 29 times; Step 6: 72°C, 5 min; Step 7: storage at 4°C. DNA was quantified by PICOGREEN reagent (Molecular Probes) as described above. Samples with low DNA recoveries were reamplified using the same conditions as described above. Samples were diluted with 20% dimethylsulfoxide (1:2, v/v), and sequenced using DYENAMIC energy transfer sequencing primers and the DYENAMIC DIRECT kit (Amersham Pharmacia Biotech) or the ABI PRISM

BIGDYE Terminator cycle sequencing ready reaction kit (Perkin-Elmer).

In like manner, the nucleotide sequences of SEQ ID NO:23-44 are used to obtain 5' regulatory sequences using the procedure above, oligonucleotides designed for such extension, and an appropriate genomic library.

5 **VI. Labeling and Use of Individual Hybridization Probes**

Hybridization probes derived from SEQ ID NO:23-44 are employed to screen cDNAs, genomic DNAs, or mRNAs. Although the labeling of oligonucleotides, consisting of about 20 base pairs, is specifically described, essentially the same procedure is used with larger nucleotide fragments. Oligonucleotides are designed using state-of-the-art software such as OLIGO 4.06
10 software (National Biosciences) and labeled by combining 50 pmol of each oligomer, 250 μ Ci of [γ - 32 P] adenosine triphosphate (Amersham Pharmacia Biotech), and T4 polynucleotide kinase (DuPont NEN, Boston MA). The labeled oligonucleotides are substantially purified using a SEPHADEX G-25 superfine size exclusion dextran bead column (Amersham Pharmacia Biotech). An aliquot containing 10^7 counts per minute of the labeled probe is used in a typical membrane-based
15 hybridization analysis of human genomic DNA digested with one of the following endonucleases: Ase I, Bgl II, Eco RI, Pst I, Xba I, or Pvu II (DuPont NEN).

The DNA from each digest is fractionated on a 0.7% agarose gel and transferred to nylon membranes (Nytran Plus, Schleicher & Schuell, Durham NH). Hybridization is carried out for 16 hours at 40°C. To remove nonspecific signals, blots are sequentially washed at room temperature
20 under conditions of up to, for example, 0.1 x saline sodium citrate and 0.5% sodium dodecyl sulfate. Hybridization patterns are visualized using autoradiography or an alternative imaging means and compared.

VII. Microarrays

A chemical coupling procedure and an ink jet device can be used to synthesize array
25 elements on the surface of a substrate. (See, e.g., Baldeschweiler, *supra*.) An array analogous to a dot or slot blot may also be used to arrange and link elements to the surface of a substrate using thermal, UV, chemical, or mechanical bonding procedures. A typical array may be produced by hand or using available methods and machines and contain any appropriate number of elements. After hybridization, nonhybridized probes are removed and a scanner used to determine the levels and
30 patterns of fluorescence. The degree of complementarity and the relative abundance of each probe which hybridizes to an element on the microarray may be assessed through analysis of the scanned images.

Full-length cDNAs, Expressed Sequence Tags (ESTs), or fragments thereof may comprise the elements of the microarray. Fragments suitable for hybridization can be selected using software
35 well known in the art such as LASERGENE software (DNASTAR). Full-length cDNAs, ESTs, or

fragments thereof corresponding to one of the nucleotide sequences of the present invention, or selected at random from a cDNA library relevant to the present invention, are arranged on an appropriate substrate, e.g., a glass slide. The cDNA is fixed to the slide using, e.g., UV cross-linking followed by thermal and chemical treatments and subsequent drying. (See, e.g., Schena, M. et al. (1995) Science 270:467-470; Shalon, D. et al. (1996) Genome Res. 6:639-645.) Fluorescent probes are prepared and used for hybridization to the elements on the substrate. The substrate is analyzed by procedures described above.

VIII. Complementary Polynucleotides

Sequences complementary to the HSECP-encoding sequences, or any parts thereof, are used to detect, decrease, or inhibit expression of naturally occurring HSECP. Although use of oligonucleotides comprising from about 15 to 30 base pairs is described, essentially the same procedure is used with smaller or with larger sequence fragments. Appropriate oligonucleotides are designed using OLIGO 4.06 software (National Biosciences) and the coding sequence of HSECP. To inhibit transcription, a complementary oligonucleotide is designed from the most unique 5' sequence and used to prevent promoter binding to the coding sequence. To inhibit translation, a complementary oligonucleotide is designed to prevent ribosomal binding to the HSECP-encoding transcript.

IX. Expression of HSECP

Expression and purification of HSECP is achieved using bacterial or virus-based expression systems. For expression of HSECP in bacteria, cDNA is subcloned into an appropriate vector containing an antibiotic resistance gene and an inducible promoter that directs high levels of cDNA transcription. Examples of such promoters include, but are not limited to, the *trp-lac (tac)* hybrid promoter and the T5 or T7 bacteriophage promoter in conjunction with the *lac* operator regulatory element. Recombinant vectors are transformed into suitable bacterial hosts, e.g., BL21(DE3). Antibiotic resistant bacteria express HSECP upon induction with isopropyl beta-D-thiogalactopyranoside (IPTG). Expression of HSECP in eukaryotic cells is achieved by infecting insect or mammalian cell lines with recombinant Autographica californica nuclear polyhedrosis virus (AcMNPV), commonly known as baculovirus. The nonessential polyhedrin gene of baculovirus is replaced with cDNA encoding HSECP by either homologous recombination or bacterial-mediated transposition involving transfer plasmid intermediates. Viral infectivity is maintained and the strong polyhedrin promoter drives high levels of cDNA transcription. Recombinant baculovirus is used to infect Spodoptera frugiperda (Sf9) insect cells in most cases, or human hepatocytes, in some cases. Infection of the latter requires additional genetic modifications to baculovirus. (See Engelhard, E.K. et al. (1994) Proc. Natl. Acad. Sci. USA 91:3224-3227; Sandig, V. et al. (1996) Hum. Gene Ther. 7:1937-1945.)

In most expression systems, HSECP is synthesized as a fusion protein with, e.g., glutathione S-transferase (GST) or a peptide epitope tag, such as FLAG or 6-His, permitting rapid, single-step, affinity-based purification of recombinant fusion protein from crude cell lysates. GST, a 26-kilodalton enzyme from *Schistosoma japonicum*, enables the purification of fusion proteins on immobilized glutathione under conditions that maintain protein activity and antigenicity (Amersham Pharmacia Biotech). Following purification, the GST moiety can be proteolytically cleaved from HSECP at specifically engineered sites. FLAG, an 8-amino acid peptide, enables immunoaffinity purification using commercially available monoclonal and polyclonal anti-FLAG antibodies (Eastman Kodak). 6-His, a stretch of six consecutive histidine residues, enables purification on metal-chelate resins (QIAGEN). Methods for protein expression and purification are discussed in Ausubel (1995, *supra*, ch. 10 and 16). Purified HSECP obtained by these methods can be used directly in the following activity assay.

X. Demonstration of HSECP Activity

An assay for HSECP activity measures the expression of HSECP on the cell surface. cDNA encoding HSECP is subcloned into an appropriate mammalian expression vector suitable for high levels of cDNA expression. The resulting construct is transfected into a nonhuman cell line such as NIH3T3. Cell surface proteins are labeled with biotin using methods known in the art. Immunoprecipitations are performed using HSECP-specific antibodies, and immunoprecipitated samples are analyzed using SDS-PAGE and immunoblotting techniques. The ratio of labeled immunoprecipitant to unlabeled immunoprecipitant is proportional to the amount of HSECP expressed on the cell surface.

Alternatively, an assay for HSECP activity measures the amount of HSECP in secretory, membrane-bound organelles. Transfected cells as described above are harvested and lysed. The lysate is fractionated using methods known to those of skill in the art, for example, sucrose gradient ultracentrifugation. Such methods allow the isolation of subcellular components such as the Golgi apparatus, ER, small membrane-bound vesicles, and other secretory organelles.

Immunoprecipitations from fractionated and total cell lysates are performed using HSECP-specific antibodies, and immunoprecipitated samples are analyzed using SDS-PAGE and immunoblotting techniques. The concentration of HSECP in secretory organelles relative to HSECP in total cell lysate is proportional to the amount of HSECP in transit through the secretory pathway.

XI. Functional Assays

HSECP function is assessed by expressing the sequences encoding HSECP at physiologically elevated levels in mammalian cell culture systems. cDNA is subcloned into a mammalian expression vector containing a strong promoter that drives high levels of cDNA expression. Vectors of choice include pCMV SPORT plasmid (Life Technologies) and pCR3.1

plasmid (Invitrogen), both of which contain the cytomegalovirus promoter. 5-10 μ g of recombinant vector are transiently transfected into a human cell line, for example, an endothelial or hematopoietic cell line, using either liposome formulations or electroporation. 1-2 μ g of an additional plasmid containing sequences encoding a marker protein are co-transfected. Expression of a marker protein provides a means to distinguish transfected cells from nontransfected cells and is a reliable predictor of cDNA expression from the recombinant vector. Marker proteins of choice include, e.g., Green Fluorescent Protein (GFP; Clontech), CD64, or a CD64-GFP fusion protein. Flow cytometry (FCM), an automated, laser optics-based technique, is used to identify transfected cells expressing GFP or CD64-GFP and to evaluate the apoptotic state of the cells and other cellular properties. FCM detects and quantifies the uptake of fluorescent molecules that diagnose events preceding or coincident with cell death. These events include changes in nuclear DNA content as measured by staining of DNA with propidium iodide; changes in cell size and granularity as measured by forward light scatter and 90 degree side light scatter; down-regulation of DNA synthesis as measured by decrease in bromodeoxyuridine uptake; alterations in expression of cell surface and intracellular proteins as measured by reactivity with specific antibodies; and alterations in plasma membrane composition as measured by the binding of fluorescein-conjugated Annexin V protein to the cell surface. Methods in flow cytometry are discussed in Ormerod, M.G. (1994) Flow Cytometry, Oxford, New York NY.

The influence of HSECP on gene expression can be assessed using highly purified populations of cells transfected with sequences encoding HSECP and either CD64 or CD64-GFP. CD64 and CD64-GFP are expressed on the surface of transfected cells and bind to conserved regions of human immunoglobulin G (IgG). Transfected cells are efficiently separated from nontransfected cells using magnetic beads coated with either human IgG or antibody against CD64 (DYNAL, Lake Success NY). mRNA can be purified from the cells using methods well known by those of skill in the art. Expression of mRNA encoding HSECP and other genes of interest can be analyzed by northern analysis or microarray techniques.

XII. Production of HSECP Specific Antibodies

HSECP substantially purified using polyacrylamide gel electrophoresis (PAGE; see, e.g., Harrington, M.G. (1990) *Methods Enzymol.* 182:488-495), or other purification techniques, is used to immunize rabbits and to produce antibodies using standard protocols.

Alternatively, the HSECP amino acid sequence is analyzed using LASERGENE software (DNASTAR) to determine regions of high immunogenicity, and a corresponding oligopeptide is synthesized and used to raise antibodies by means known to those of skill in the art. Methods for selection of appropriate epitopes, such as those near the C-terminus or in hydrophilic regions are well described in the art. (See, e.g., Ausubel, 1995, supra, ch. 11.)

Typically, oligopeptides of about 15 residues in length are synthesized using an ABI 431A

peptide synthesizer (Perkin-Elmer) using fmoc-chemistry and coupled to KLH (Sigma-Aldrich, St. Louis MO) by reaction with N-maleimidobenzoyl-N-hydroxysuccinimide ester (MBS) to increase immunogenicity. (See, e.g., Ausubel, 1995, supra.) Rabbits are immunized with the oligopeptide-KLH complex in complete Freund's adjuvant. Resulting antisera are tested for antipeptide and anti-HSECP activity by, for example, binding the peptide or HSECP to a substrate, blocking with 1% BSA, reacting with rabbit antisera, washing, and reacting with radio-iodinated goat anti-rabbit IgG.

XIII. Purification of Naturally Occurring HSECP Using Specific Antibodies

Naturally occurring or recombinant HSECP is substantially purified by immunoaffinity chromatography using antibodies specific for HSECP. An immunoaffinity column is constructed by covalently coupling anti-HSECP antibody to an activated chromatographic resin, such as CNBr-activated SEPHAROSE (Amersham Pharmacia Biotech). After the coupling, the resin is blocked and washed according to the manufacturer's instructions.

Media containing HSECP are passed over the immunoaffinity column, and the column is washed under conditions that allow the preferential absorbance of HSECP (e.g., high ionic strength buffers in the presence of detergent). The column is eluted under conditions that disrupt antibody/HSECP binding (e.g., a buffer of pH 2 to pH 3, or a high concentration of a chaotrope, such as urea or thiocyanate ion), and HSECP is collected.

XIV. Identification of Molecules Which Interact with HSECP

HSECP, or biologically active fragments thereof, are labeled with ¹²⁵I Bolton-Hunter reagent. (See, e.g., Bolton A.E. and W.M. Hunter (1973) Biochem. J. 133:529-539.) Candidate molecules previously arrayed in the wells of a multi-well plate are incubated with the labeled HSECP, washed, and any wells with labeled HSECP complex are assayed. Data obtained using different concentrations of HSECP are used to calculate values for the number, affinity, and association of HSECP with the candidate molecules.

Alternatively, molecules interacting with HSECP are analyzed using the yeast two-hybrid system as described in Fields, S. and O. Song (1989, Nature 340:245-246), or using commercially available kits based on the two-hybrid system, such as the MATCHMAKER system (Clontech).

Various modifications and variations of the described methods and systems of the invention will be apparent to those skilled in the art without departing from the scope and spirit of the invention. Although the invention has been described in connection with certain embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are obvious to those skilled in molecular biology or related fields are intended to be within the scope of the following claims.

Table 1

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|--|
| 1 | 23 | 078811 | SYNORAB01 | 078811H1 (SYNORAB01), 078811R6 (SYNORAB01), 078811T6 (SYNORAB01), |
| 2 | 24 | 371156 | LUNGNOT02 | 077182F1 (SYNORAB01), 077182R1 (SYNORAB01), 289599H1 (TMLR3DT01), 371156H1 (LUNGNOT02), 523415H1 (MLR2DT01), 3438708F6 (PENCNOT06), 3772179F6 (BRSTNOT25), 3808004H1 (CONTTUT01) |
| 3 | 25 | 584050 | PROSNOT02 | 584050H1 (PROSNOT02), 1726563T6 (PROSNOT14), 1739666R6 (HIPONON01), 1856214F6 (PROSNOT18), 2305379R6 (NGANNOT01), 2681374F6 (SINIUCT01), 4070575H1 (KIDNNOT26), 5274539H1 (OVARIN02), SZAI01719F1, SASA02714F1 |
| 4 | 26 | 863808 | BRAITUT03 | 851821H1 (NGANNOT01), 863808H1 (BRAITUT03), 863808T1 (BRAITUT03), 2735728F6 (OVARNOT09) |
| 5 | 27 | 978433 | BRSTNOT02 | 054823R1 (FIBRNOT01), 978433H1 (BRSTNOT02), 978433R1 (BRSTNOT02), 1867687T6 (SKINBIT01), 2503122H1 (CONUTUT01), 2532586H1 (GELANOT02), 3411659H1 (BRSTTUS08) |
| 6 | 28 | 1655369 | PROSTUT08 | 746013R1 (BRAITUT01), 944864R6 (RATRNOT02), 1539790R1 (SINTTUT01), 1617847F6 (BRAITUT12), 1655369F6 (PROSTUT08), 1655369H1 (PROSTUT08), 1673290F6 (BLADNOT05), 2056840R6 (BEPINOT01), 3407992H1 (PROSTUS08), 4077365H1 (PANCNOT19), 4098012H1 (BRAITUT26) |

Table 1 (cont.)

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|------------|--|
| 7 | 29 | 1703244 | DUODNOT02 | 273878H1 (PANCIT03), 1632051H1 (COLNNOT19), 1703244H1 (DUODNOT02), 4176224H1 (SINTNOT21) |
| 8 | 30 | 1730819 | BRSTTUT08 | 862188R1 (BRAITUT03), 1399644F1 (BRAITUT08), 1443690F1 (THYRNOT03), 1596446F1 (BRAINOT14), 1730819F6 (BRSTTUT08), 1730819H1 (BRSTTUT08), 2304942H1 (NGANNOT01), 2868843H1 (THYRNOT10), 3395457H1 (LUNGNOT28) |
| 9 | 31 | 1757161 | PITUNOT03 | 864626R1 (BRAITUT03), 1231577H1 (BRAITUT01), 1395593F1 (THYRNOT03), 1466766T1 (PANCITUT02), 1466766T6 (PANCITUT02), 1597583F6 (BRAINOT14), 1757161H1 (PITUNOT03), 1757161R6 (PITUNOT03), 1757161T6 (PITUNOT03) |
| 10 | 32 | 1976095 | PANCITUT02 | 864976T1 (BRAITUT03), 1976095H1 (PANCITUT02), 4616101H1 (BRAYDIT01), SARB01143F1, SARB01861F1, SAJA02355F1 |
| 11 | 33 | 2169991 | ENDCNOT03 | 2169991H1 (ENDCNOT03), 2313548R3 (NGANNOT01), 2727735T3 (OVARUT05), 3095616H1 (CERVNOT03), 3186421H1 (THYMNON04), 3493007H1 (ADRETUT07), SASA03601F1, SBGA05288F1, SBDA00157F1 |
| 12 | 34 | 2616827 | GBLANOT01 | 2616827H1 (GBLANOT01), 4637616F6 (MYEPTXT01), 5219252H1 (BRSTNOT35) |
| 13 | 35 | 2991370 | KIDNFET02 | 080447R1 (SYNORAB01), 190292R1 (SYNORAB01), 192279R1 (SYNORAB01), 2724873H1 (OVARUT05), 2991370H1 (KIDNFET02), SAUA03596F1, SAUA01525F1 |

Table 1 (cont.)

| Polypeptide SEQ ID NO: | Nucleotide SEQ ID NO: | Clone ID | Library | Fragments |
|---------------------------|--------------------------|----------|-----------|---|
| 14 | 36 | 3031062 | TYMNOT05 | 1354027T3 (LUNGNOT09), 2889215F6 (LUNGFET04), 3031062H1 (TYMNOT05), SBAA042335F1, SBAA00620F1, SBAA01760F1, SBAA04365F2, SBAA01589F1 |
| 15 | 37 | 3101617 | BRAINOT20 | 3101617H1 (BRAINOT20), 3335717F6 (BRAIFET01), SCAA04574V1, SCAA04351V1, SCAA03628V1, SCAA05459V1, SCAA01004V1 |
| 16 | 38 | 3216178 | TESTNOT07 | 632084R6 (KIDNNOT05), 1993593T6 (CORPNOT02), 3216178F6 (TESTNOT07), 3216178H1 (TESTNOT07), 4914242H1 (LIVRFET05) |
| 17 | 39 | 3406803 | PROSTUS08 | 3406803F6 (PROSTUS08), 3406803H1 (PROSTUS08), 3406803T6 (PROSTUS08) |
| 18 | 40 | 3468066 | BRAIDIT01 | 659544H1 (BRAINOT03), 897142R1 (BRSTNOT05), 1321038F1 (BLADNOT04), 1351888F1 (LATRTUT02), 1485695F1 (CORPNOT02), 1507666F1 (LUNGNOT14), 2953291H1 (KIDNFET01), 3468066H1 (BRAIDIT01), 4426018F6 (BRAPDIT01) |
| 19 | 41 | 3592862 | 293TF5T01 | 941610H1 (ADRENOT03), 1288036H1 (BRAINOT11), 1687969F6 (PROSTUT10), 3592862H1 (293TF5T01) |
| 20 | 42 | 3669422 | KIDNTUT16 | 3669422F6 (KIDNTUT16), 3669422H1 (KIDNTUT16), 3669422T6 (KIDNTUT16), 5445503H1 (LNODNOT12) |
| 21 | 43 | 3688740 | HEAANOT01 | 462098R6 (LATRNOT01), 3688740H1 (HEAANOT01) |
| 22 | 44 | 3742589 | THYMNOT08 | 938795R1 (CERVNOT01), 1255960T1 (MENITUT03), 1530330R1 (PANCNOT04), 3742589H1 (THYMNOT08), SBOA04142D1 |

Table 2

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosylation Sites | Potential Signal Peptides and Other Signature Sequences | Analytical Methods |
|---------------------------|------------------------|---------------------------------------|-------------------------------------|---|-------------------------|
| 1 | 182 | S149 T151 S13 | | M1-S16; M1-P18 | MOTIFS SPSCAN HMM |
| 2 | 125 | T87 S36 T78 T111 | N75 | M1-S37 | MOTIFS SPSCAN HMM |
| 3 | 320 | S21 T63 S267 S300 T164 | N40 | M1-G20; M1-G23 | MOTIFS SPSCAN HMM |
| 4 | 234 | T74 S198 T210 T227 S131 T195 | | M1-A30; M1-G25 | MOTIFS SPSCAN HMM |
| 5 | 278 | S64 S132 S230 T252 S7 S179 | N221 | M1-A65 | MOTIFS SPSCAN HMM |
| 6 | 136 | S98 S99 | | M1-P54 | MOTIFS SPSCAN HMM |
| 7 | 109 | T57 | | M1-T20 | MOTIFS SPSCAN HMM |

Table 2 (cont.)

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosylation Sites | Potential Signal Peptides and Other Signature Sequences | Analytical Methods |
|---------------------------|------------------------|---|-------------------------------------|---|-------------------------|
| 8 | 262 | S73 S91 S136 S86 | N182 | M1-A25; M1-G27 | MOTIFS SPSCAN HMM |
| 9 | 384 | S11 T140 S32 S185 S232 S306 S378 | N50 N59 N62 N304 | M1-G31 Transmembrane domains: G195-A220 L74-F91 A142-T160 | MOTIFS SPSCAN HMM |
| 10 | 244 | T95 S110 T208 T44 S47 S53 S69 S152 T194 | | M1-A23 | MOTIFS SPSCAN HMM |
| 11 | 326 | S138 T59 S239 | N129 N237 | M1-G40 | MOTIFS SPSCAN HMM |
| 12 | 105 | S96 T24 | N94 | M1-A19; M1-A23 | MOTIFS SPSCAN HMM |

Table 2 (cont.)

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosylation Sites | Potential Signal Peptides and Other Signature Sequences | Analytical Methods |
|---------------------------|------------------------|---|-------------------------------------|---|--|
| 13 | 626 | S188 S593 T61 T118 T144 S252 T275 T410 S423 S501 T506 S524 T536 S550 S28 T146 S336 T467 S583 T588 | | M1-G27 RGD tripeptide: R271-D273 | MOTIFS SPSCAN HMM |
| 14 | 296 | S205 T295 S109 T165 T214 S244 S73 S225 Y236 | N40 N53 N204 N281 | M1-G23 | MOTIFS SPSCAN HMM |
| 15 | 249 | S7 T123 S233 S237 T151 | N100 | M1-G23; M1-A22 Transmembrane domains: T175-A193 P97-F120 | MOTIFS SPSCAN HMM |
| 16 | 124 | S62 S109 | | M1-G37 Somatomedin B signature: L36-S105 | MOTIFS SPSCAN HMM PROFILESCAN |
| 17 | 101 | T59 S67 | | M1-S40; M1-S28 | MOTIFS SPSCAN HMM |

Table 2 (cont.)

| Polypeptide SEQ ID NO: | Amino Acid Residues | Potential Phosphorylation Sites | Potential Glycosylation Sites | Potential Signal Peptides and Other Signature Sequences | Analytical Methods |
|---------------------------|------------------------|---|-------------------------------------|--|-----------------------------------|
| 18 | 540 | S42 S38 T80 T172 S179 S326 S519 S531 T131 T250 T278 Y99 | N78 N88 N170 N347 N448 N457 | M1-C29; M1-I31 Transmembrane domains: V307-N327 L411-I428 A140-L163 D366-I385 Y99-Y122 F496-C513 I56-Y73 | MOTIFS SPSCAN HMM PRINTS |
| 19 | 108 | S34 S64 S29 S47 Y96 | | M1-R22; M1-S23 | MOTIFS SPSCAN HMM |
| 20 | 114 | S108 S5 S73 T85 | | M1-T32 | MOTIFS SPSCAN HMM |
| 21 | 114 | T8 | N6 | M1-A34 | MOTIFS SPSCAN HMM |
| 22 | 287 | S25 T75 T134 T139 S225 T255 S254 | | M1-P20; M1-A22 RGD tripeptide: R172-D174 | MOTIFS SPSCAN HMM |

Table 3

| Nucleotide SEQ ID NO: | Selected Fragment(s) | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|----------------------|--|--|-------------|
| 23 | 110-154 542-586 | Musculoskeletal (0.750) Reproductive (0.250) | Inflammation (0.750) Cancer (0.250) | PBLUESCRIPT |
| 24 | 230-271 | Reproductive (0.333) Musculoskeletal (0.190) Cardiovascular (0.143) | Cancer (0.476) Inflammation (0.333) | PBLUESCRIPT |
| 25 | 109-153 649-693 | Reproductive (0.314) Nervous (0.235) Gastrointestinal (0.157) | Cancer (0.608) Inflammation (0.196) Cell Proliferation (0.118) | PSPORT1 |
| 26 | 116-160 | Reproductive (0.333) Nervous (0.178) Cardiovascular (0.156) | Cancer (0.600) Cell Proliferation (0.178) Inflammation (0.133) | PSPORT1 |
| 27 | 228-272 | Reproductive (0.333) Cardiovascular (0.244) Gastrointestinal (0.111) | Cancer (0.667) Cell Proliferation (0.133) Inflammation (0.089) | PSPORT1 |
| 28 | 1945-1989 | Nervous (0.301) Reproductive (0.219) Gastrointestinal (0.137) | Cancer (0.452) Inflammation (0.205) Trauma (0.164) | pINCY |
| 29 | 271-315 | Gastrointestinal (0.800) Nervous (0.200) | Trauma (0.600) Cancer (0.200) Inflammation (0.200) | pINCY |
| 30 | 218-262 | Reproductive (0.249) Nervous (0.195) Gastrointestinal (0.136) | Cancer (0.521) Inflammation (0.207) Cell Proliferation (0.172) | pINCY |

Table 3 (cont.)

| Nucleotide SEQ ID NO: | Selected Fragment(s) | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|------------------------|--|--|---------|
| 31 | 1190-1234 | Nervous (0.324) Reproductive (0.250) Hematopoietic/Immune (0.118) | Cancer (0.426) Inflammation (0.279) Cell Proliferation (0.147) | PSPORT1 |
| 32 | 487-531 | Gastrointestinal (0.333) Nervous (0.259) Reproductive (0.111) | Cancer (0.593) Inflammation (0.148) Cell Proliferation (0.111) | pINCY |
| 33 | 1513-1557 | Reproductive (0.255) Nervous (0.216) Hematopoietic/Immune (0.176) | Cancer (0.373) Inflammation (0.255) Cell Proliferation (0.196) | pINCY |
| 34 | 270-317 | Hematopoietic/Immune (0.455) Musculoskeletal (0.182) Nervous (0.182) | Inflammation (0.545) Cancer (0.273) Cell Proliferation (0.091) | pINCY |
| 35 | 1299-1343 1956-2000 | Musculoskeletal (0.519) Nervous (0.148) Cardiovascular (0.111) | Inflammation (0.481) Cancer (0.296) Trauma (0.074) | pINCY |
| 36 | 651-695 | Nervous (0.250) Developmental (0.167) Gastrointestinal (0.167) | Cell Proliferation (0.667) Inflammation (0.250) Cancer (0.167) | pINCY |
| 37 | 218-262 | Nervous (0.818) Gastrointestinal (0.091) Reproductive (0.091) | Cancer (0.545) Cell Proliferation (0.091) Inflammation (0.091) | pINCY |
| 38 | 290-334 | Hematopoietic/Immune (0.250) Urologic (0.250) Developmental (0.125) | Cell Proliferation (0.375) Inflammation (0.250) Cancer (0.125) | pINCY |

Table 3 (cont.)

| Nucleotide SEQ ID NO: | Selected Fragment(s) | Tissue Expression (Fraction of Total) | Disease or Condition (Fraction of Total) | Vector |
|--------------------------|----------------------|---|--|--------|
| 39 | 434-478 | Reproductive (1.000) | Cancer (1.000) | pINCY |
| 40 | 326-370 | Nervous (0.242) Reproductive (0.220) Gastrointestinal (0.121) | Cancer (0.462) Inflammation (0.280) Cell Proliferation (0.121) | pINCY |
| 41 | 165-209 | Nervous (0.333) Gastrointestinal (0.200) Cardiovascular (0.133) | Cancer (0.467) Cell Proliferation (0.200) Inflammation (0.133) | pINCY |
| 42 | 273-317 | Hematopoietic/Immune (0.312) Nervous (0.188) Reproductive (0.167) | Cancer (0.354) Inflammation (0.312) Cell Proliferation (0.146) | pINCY |
| 43 | 273-317 | Cardiovascular (1.000) | Inflammation (0.500) | pINCY |
| 44 | 435-479 | Reproductive (0.297) Nervous (0.217) Gastrointestinal (0.109) | Cancer (0.464) Cell Proliferation (0.196) Inflammation (0.167) | pINCY |

Table 4

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 23 | SYNORAB01 | This library was constructed using RNA isolated from the synovial membrane tissue of a 68-year-old Caucasian female with rheumatoid arthritis. |
| 24 | LUNGNOT02 | This library was constructed using RNA isolated from the lung tissue of a 47-year-old Caucasian male who died of a subarachnoid hemorrhage. |
| 25 | PROSNOT02 | This library was constructed using RNA isolated from diseased prostate tissue removed from a 50-year-old Caucasian male during a retropubic prostatectomy. Pathology indicated adenofibromatous hyperplasia. Pathology for the associated tumor tissue indicated adenocarcinoma Gleason grade 3+3. Patient history included dysuria, carcinoma in situ of prostate, coronary atherosclerosis, and hyperlipidemia. |
| 26 | BRAITUT03 | This library was constructed using RNA isolated from brain tumor tissue removed from the left frontal lobe of a 17-year-old Caucasian female during excision of a cerebral meningeal lesion. Pathology indicated a grade 4 fibrillary giant and small-cell astrocytoma. Family history included benign hypertension and cerebrovascular disease. |
| 27 | BRSTNOT02 | This library was constructed using RNA isolated from diseased breast tissue removed from a 55-year-old Caucasian female during a unilateral extended simple mastectomy. Pathology indicated proliferative fibrocystic changes characterized by apocrine metaplasia, sclerosing adenosis, cyst formation, and ductal hyperplasia without atypia. Pathology for the associated tumor tissue indicated an invasive grade 4 mammary adenocarcinoma. Patient history included atrial tachycardia and a benign neoplasm. Family history included cardiovascular and cerebrovascular disease. |

Table 4 (cont.)

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 28 | PROSTUT08 | This library was constructed using RNA isolated from prostate tumor tissue removed from a 60-year-old Caucasian male during radical prostatectomy and regional lymph node excision. Pathology indicated an adenocarcinoma (Gleason grade 3+4). Adenofibromatous hyperplasia was also present. The patient presented with elevated prostate specific antigen (PSA). Patient history included a kidney cyst, and hematuria. Family history included tuberculosis, cerebrovascular disease, and arteriosclerotic coronary artery disease. |
| 29 | DUODNOT02 | This library was constructed using RNA isolated from duodenal tissue of an 8-year-old Caucasian female, who died from head trauma. Serology was positive for cytomegalovirus (CMV). |
| 30 | BRSTTUT08 | This library was constructed using RNA isolated from breast tumor tissue removed from a 45-year-old Caucasian female during unilateral extended simple mastectomy. Pathology indicated invasive nuclear grade 2-3 adenocarcinoma, ductal type, with 3 of 23 lymph nodes positive for metastatic disease. Greater than 50% of the tumor volume was in situ, both comedo and non-comedo types. Immunostains were positive for estrogen/progesterone receptors, and uninvolved tissue showed proliferative changes. The patient concurrently underwent a total abdominal hysterectomy. Patient history included valvuloplasty of mitral valve without replacement, rheumatic mitral insufficiency, and rheumatic heart disease. Family history included acute myocardial infarction, atherosclerotic coronary artery disease, and type II diabetes. |
| 31 | PITUNOT03 | This library was constructed using RNA isolated from pituitary tissue of a 46-year-old Caucasian male who died from colon cancer. |
| 32 | PANCTUT02 | This library was constructed using RNA isolated from pancreatic tumor tissue removed from a 45-year-old Caucasian female during radical pancreaticoduodenectomy. Pathology indicated a grade 4 anaplastic carcinoma. Family history included benign hypertension, hyperlipidemia and atherosclerotic coronary artery disease. |

Table 4 (cont.)

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 33 | ENDCNOT03 | This library was constructed using RNA isolated from dermal microvascular endothelial cells removed from a neonatal Caucasian male. |
| 34 | GBLANOT01 | This library was constructed using RNA isolated from diseased gallbladder tissue removed from a 53-year-old Caucasian female during a cholecystectomy. Pathology indicated mild chronic cholecystitis and cholelithiasis with approximately 150 mixed gallstones. Family history included benign hypertension. |
| 35 | KIDNFET02 | This library was constructed using RNA isolated from kidney tissue removed from a Caucasian male fetus who was stillborn with a hypoplastic left heart at 23 weeks' gestation. |
| 36 | TYMNOT05 | This library was constructed using RNA isolated from nonactivated Th2 cells. The cells were differentiated from umbilical cord CD4 T cells with IL-4 in the presence of anti-IL-12 antibodies and B7-transfected COS cells. |

Table 4 (cont.)

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 37 | BRAINOT20 | <p>This library was constructed using RNA isolated from diseased brain tissue removed from the left temporal lobe of a 27-year-old Caucasian male during a brain lobectomy. Pathology for the left temporal lobe, including the mesial temporal structures, indicated focal, marked pyramidal cell loss and gliosis in hippocampal sector CA1, consistent with mesial temporal sclerosis. The left frontal lobe showed a focal deep white matter lesion, characterized by marked gliosis, calcifications, and hemosiderin-laden macrophages, consistent with a remote perinatal injury. This frontal lobe tissue also showed mild to moderate generalized gliosis, predominantly subpial and subcortical, consistent with chronic seizure disorder. GFAP was positive for astrocytes. Family history included brain cancer.</p> |
| 38 | TESTNOT07 | <p>This library was constructed using RNA isolated from testicular tissue removed from a 31-year-old Caucasian male during a unilateral orchiectomy (excision of testis). Pathology indicated a mass containing a large subcapsular hematoma with laceration of the tunica albuginea. The surrounding testicular parenchyma was extensively necrotic. The patient presented with a trunk injury.</p> |
| 39 | PROSTUS08 | <p>This subtracted library was constructed using 2.36 million clones from a prostate tumor library and was subjected to one round of subtractive hybridization with 448,000 clones from a prostate library. The starting library for subtraction was constructed using RNA isolated from a prostate tumor removed from a 59-year-old Caucasian male during a radical prostatectomy with regional lymph node excision. Pathology indicated adenocarcinoma (Gleason grade 3+3) and adenofibromatous hyperplasia. The patient presented with elevated prostate-specific antigen (PSA). Patient history included colon diverticuli, asbestosis, and thrombophlebitis. Family history included multiple myeloma, hyperlipidemia, and rheumatoid arthritis. Subtractive hybridization conditions were based on the methodologies of Swaroop et al., NAR (1991) 19:1954 and Bonaldo, et al. Genome Research (1996) 6:791.</p> |
| 40 | BRAIDIT01 | <p>This library was constructed using RNA isolated from diseased brain tissue. Patient history included multiple sclerosis, type II lesion.</p> |

Table 4 (cont.)

| Nucleotide SEQ ID NO: | Library | Library Description |
|--------------------------|-----------|--|
| 41 | 293TF5T01 | This library was constructed using RNA isolated from a transformed embryonal cell line (293-EBNA) derived from kidney epithelial tissue transfected with bgal. The cells were transformed with adenovirus 5 DNA. |
| 42 | KIDNTUT16 | This library was constructed using RNA isolated from left pole kidney tumor tissue removed from a 53-year-old Caucasian female during a nephroureterectomy. Pathology indicated grade 2 renal cell carcinoma. Patient history included hyperlipidemia, cardiac dysrhythmia, menorrhagia, cerebrovascular disease, atherosclerotic coronary artery disease, and tobacco abuse. Family history included cerebrovascular disease and atherosclerotic coronary artery disease. |
| 43 | HEANOT01 | This library was constructed using RNA isolated from right coronary and right circumflex coronary artery tissue removed from the explanted heart of a 46-year-old Caucasian male during a heart transplantation. Patient history included myocardial infarction from total occlusion of the left anterior descending coronary artery, atherosclerotic coronary artery disease, hyperlipidemia, myocardial ischemia, dilated cardiomyopathy, left ventricular dysfunction, and tobacco abuse. Previous surgeries included cardiac catheterization. Family history included atherosclerotic coronary artery disease. |
| 44 | THYMNOT08 | This library was constructed using RNA isolated from thymus tissue removed from a 4-month-old Caucasian male during a total thymectomy and open heart repair of atrioventricular canal defect using hypothermia. Patient presented with a congenital heart anomaly, congestive heart failure, and Down syndrome. Patient history included abnormal thyroid function study, premature birth, and right and left heart angiocardiology. |

Table 5

| Program | Description | Reference | Parameter Threshold |
|-------------------|---|--|---|
| ABI FACTURA | A program that removes vector sequences and masks ambiguous bases in nucleic acid sequences. | Perkin-Elmer Applied Biosystems, Foster City, CA. | |
| ABI/PARACEL FDF | A Fast Data Finder useful in comparing and annotating amino acid or nucleic acid sequences. | Perkin-Elmer Applied Biosystems, Foster City, CA; Paracel Inc., Pasadena, CA. | Mismatch <50% |
| ABI AutoAssembler | A program that assembles nucleic acid sequences. | Perkin-Elmer Applied Biosystems, Foster City, CA. | |
| BLAST | A Basic Local Alignment Search Tool useful in sequence similarity search for amino acid and nucleic acid sequences. BLAST includes five functions: blastp, blastn, blastx, tblastn, and tblastx. | Altschul, S.F. et al. (1990) J. Mol. Biol. 215:403-410; Altschul, S.F. et al. (1997) Nucleic Acids Res. 25: 3389-3402. | ESTs: Probability value= 1.0E-8 or less Full Length sequences: Probability value= 1.0E-10 or less |
| FASTA | A Pearson and Lipman algorithm that searches for similarity between a query sequence and a group of sequences of the same type. FASTA comprises at least five functions: fasta, tfasta, fastx, ifastx, and ssearch. | Pearson, W.R. and D.J. Lipman (1988) Proc. Natl. Acad. Sci. 85:2444-2448; Pearson, W.R. (1990) Methods Enzymol. 183: 63-98; and Smith, T.F. and M. S. Waterman (1981) Adv. Appl. Math. 2:482-489. | ESTs: fasta E value=1.06E-6 Assembled ESTs: fasta Identity= 95% or greater and Match length=200 bases or greater; fastx E value=1.0E-8 or less Full Length sequences: fastx score=100 or greater |
| BLIMPS | A BLocks IMProved Searcher that matches a sequence against those in BLOCKS, PRINTS, DOMO, PRODOM, and PFAM databases to search for gene families, sequence homology, and structural fingerprint regions. | Henikoff, S. and J.G. Henikoff, Nucl. Acid Res., 19:6565-72, 1991. J.G. Henikoff and S. Henikoff (1996) Methods Enzymol. 266:88-105; and Attwood, T.K. et al. (1997) J. Chem. Inf. Comput. Sci. 37: 417-424. | Score=1000 or greater; Ratio of Score/Strength = 0.75 or larger; and, if applicable, Probability value= 1.0E-3 or less |
| HMMER | An algorithm for searching a query sequence against hidden Markov model (HMM)-based databases of protein family consensus sequences, such as PFAM. | Krogh, A. et al. (1994) J. Mol. Biol., 235:1501-1531; Sonnhammer, E.L.L. et al. (1988) Nucleic Acids Res. 26:320-322. | Score=10-50 bits for PFAM hits, depending on individual protein families |

Table 5 (cont.)

| Program | Description | Reference | Parameter Threshold |
|-------------|---|--|--|
| ProfileScan | An algorithm that searches for structural and sequence motifs in protein sequences that match sequence patterns defined in Prosite. | Gribskov, M. et al. (1988) CABIOS 4:61-66; Gribskov, et al. (1989) Methods Enzymol. 183:146-159; Bairoch, A. et al. (1997) Nucleic Acids Res. 25: 217-221. | Normalized quality score \geq GCG-specified "HIGH" value for that particular Prosite motif. Generally, score=1.4-2.1. |
| Phred | A base-calling algorithm that examines automated sequencer traces with high sensitivity and probability. | Ewing, B. et al. (1998) Genome Res. 8:175-185; Ewing, B. and P. Green (1998) Genome Res. 8:186-194. | |
| Phrap | A Phils Revised Assembly Program including SWAT and CrossMatch, programs based on efficient implementation of the Smith-Waterman algorithm, useful in searching sequence homology and assembling DNA sequences. | Smith, T.F. and M. S. Waterman (1981) Adv. Appl. Math. 2:482-489; Smith, T.F. and M. S. Waterman (1981) J. Mol. Biol. 147:195-197; and Green, P., University of Washington, Seattle, WA. | Score= 120 or greater; Match length= 56 or greater |
| Consed | A graphical tool for viewing and editing Phrap assemblies | Gordon, D. et al. (1998) Genome Res. 8:195-202. | |
| SPScan | A weight matrix analysis program that scans protein sequences for the presence of secretory signal peptides. | Nielson, H. et al. (1997) Protein Engineering 10:1-6; Claverie, J.M. and S. Audic (1997) CABIOS 12: 431-439. | Score=3.5 or greater |
| Motifs | A program that searches amino acid sequences for patterns that matched those defined in Prosite. | Bairoch et al. <u>supra</u> ; Wisconsin Package Program Manual, version 9, page M51-59, Genetics Computer Group, Madison, WI. | |

What is claimed is:

1. An isolated polypeptide comprising an amino acid sequence selected from the group consisting of:

- 5 a) an amino acid sequence selected from the group consisting of SEQ ID NO:1-22,
b) a naturally occurring amino acid sequence having at least 90% sequence identity to an amino acid sequence selected from the group consisting of SEQ ID NO:1-22,
c) a biologically active fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22, and
10 d) an immunogenic fragment of an amino acid sequence selected from the group consisting of SEQ ID NO:1-22.

2. An isolated polypeptide of claim 1 selected from the group consisting of SEQ ID NO:1-22.

15 3. An isolated polynucleotide encoding a polypeptide of claim 1.

4. An isolated polynucleotide of claim 3 selected from the group consisting of SEQ ID NO:23-44.

20 5. A recombinant polynucleotide comprising a promoter sequence operably linked to a polynucleotide of claim 3.

25 6. A cell transformed with a recombinant polynucleotide of claim 5.

7. A transgenic organism comprising a recombinant polynucleotide of claim 5.

8. A method for producing a polypeptide of claim 1, the method comprising:

- 30 a) culturing a cell under conditions suitable for expression of the polypeptide, wherein said cell is transformed with a recombinant polynucleotide, and said recombinant polynucleotide comprises a promoter sequence operably linked to a polynucleotide encoding the polypeptide of claim 1, and
b) recovering the polypeptide so expressed.

35 9. An isolated antibody which specifically binds to a polypeptide of claim 1.

10. An isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of:

- a) a polynucleotide sequence selected from the group consisting of SEQ ID NO:23-44,
- b) a naturally occurring polynucleotide sequence having at least 70% sequence identity to a polynucleotide sequence selected from the group consisting of SEQ ID NO:23-44,
- c) a polynucleotide sequence complementary to a),
- d) a polynucleotide sequence complementary to b), and
- e) an RNA equivalent of a)-d).

11. An isolated polynucleotide comprising at least 60 contiguous nucleotides of a polynucleotide of claim 10.

12. A method for detecting a target polynucleotide in a sample, said target polynucleotide having a sequence of a polynucleotide of claim 10, the method comprising:

- a) hybridizing the sample with a probe comprising at least 16 contiguous nucleotides comprising a sequence complementary to said target polynucleotide in the sample, and which probe specifically hybridizes to said target polynucleotide, under conditions whereby a hybridization complex is formed between said probe and said target polynucleotide, and
- b) detecting the presence or absence of said hybridization complex, and, optionally, if present, the amount thereof.

13. A method of claim 12, wherein the probe comprises at least 30 contiguous nucleotides.

14. A method of claim 12, wherein the probe comprises at least 60 contiguous nucleotides.

15. A pharmaceutical composition comprising an effective amount of a polypeptide of claim 1 and a pharmaceutically acceptable excipient.

16. A method for treating a disease or condition associated with decreased expression of functional HSECP, comprising administering to a patient in need of such treatment the pharmaceutical composition of claim 15.

17. A method for screening a compound for effectiveness as an agonist of a polypeptide of claim 1, the method comprising:

- a) exposing a sample comprising a polypeptide of claim 1 to a compound, and

b) detecting agonist activity in the sample.

18. A pharmaceutical composition comprising an agonist compound identified by a method of claim 17 and a pharmaceutically acceptable excipient.

5

19. A method for treating a disease or condition associated with decreased expression of functional HSECP, comprising administering to a patient in need of such treatment a pharmaceutical composition of claim 18.

10 20. A method for screening a compound for effectiveness as an antagonist of a polypeptide of claim 1, the method comprising:

- a) exposing a sample comprising a polypeptide of claim 1 to a compound, and
- b) detecting antagonist activity in the sample.

15 21. A pharmaceutical composition comprising an antagonist compound identified by a method of claim 20 and a pharmaceutically acceptable excipient.

20 22. A method for treating a disease or condition associated with overexpression of functional HSECP, comprising administering to a patient in need of such treatment a pharmaceutical composition of claim 21.

23. A method for screening a compound for effectiveness in altering expression of a target polynucleotide, wherein said target polynucleotide comprises a sequence of claim 4, the method comprising:

- 25
- a) exposing a sample comprising the target polynucleotide to a compound, and
 - b) detecting altered expression of the target polynucleotide.

SEQUENCE LISTING

<110> INCYTE PHARMACEUTICALS, INC.

TANG, Y. Tom

LAL, Preeti

BAUGHN, Mariah R.

YUE, Henry

AU-YOUNG, Janice

LU, Dyung Aina M.

AZIMZAI, Yalda

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 35 40 45
 Ile Lys Ser Leu Leu Tyr Pro Phe Gly Phe Pro Val Glu Leu Pro
 50 55 60
 Arg Pro Gly Pro Thr Gly Ala Tyr Lys Lys Val Lys Asn Gln Asn
 65 70 75
 Gln Thr Thr Ser Ser Glu Leu Leu Arg Lys Gln Thr Ser His Phe
 80 85 90
 Asn Gln Arg Gly His Arg Ala Arg Ser Lys Leu Leu Ala Ser Arg
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 35 40 45
 Leu Asn His Phe Arg Ser Arg Gln Pro Ile Tyr Met Ser Leu Ala
 50 55 60
 Gly Trp Thr Cys Arg Asp Asp Cys Lys Tyr Glu Cys Met Trp Val
 65 70 75
 Thr Val Gly Leu Tyr Leu Gln Glu Gly His Lys Val Pro Gln Phe
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 His Gly Lys Trp Pro Phe Ser Arg Phe Leu Phe Phe Gln Glu Pro
 95 100 105
 Ala Ser Ala Val Ala Ser Phe Leu Asn Gly Leu Ala Ser Leu Val
 110 115 120
 Met Leu Cys Arg Tyr Arg Thr Phe Val Pro Ala Ser Ser Pro Met
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 Tyr His Thr Cys Val Ala Phe Ala Trp Val Ser Leu Asn Ala Trp
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 Phe Trp Ser Thr Val Phe His Thr Arg Asp Thr Asp Leu Thr Glu
 155 160 165
 Lys Met Asp Tyr Phe Cys Ala Ser Thr Val Ile Leu His Ser Ile
 170 175 180
 Tyr Leu Cys Cys Val Arg Thr Val Gly Leu Gln His Pro Ala Val
 185 190 195
 Val Ser Ala Phe Arg Ala Leu Leu Leu Leu Met Leu Thr Val His

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| Val Ser Tyr Leu | 200 | 205 | 210 |
| Ser Leu Ile Arg Phe | 215 | Asp Tyr Gly Tyr Asn | Leu |
| Val Ala Asn Val | 230 | 220 | 225 |
| Ala Ile Gly Leu Val | 235 | Asn Val Val Trp Trp | Leu |
| Ala Trp Cys Leu | 245 | 250 | 240 |
| Trp Asn Gln Arg Arg | 260 | Leu Pro His Val Arg | Lys |
| Cys Val Val Val | 275 | 280 | 255 |
| Leu Leu Leu Gln | 290 | Gly Leu Ser Leu Leu | Glu |
| Leu Leu Asp Phe | 305 | 265 | 270 |
| Pro Pro Leu Phe Trp | 310 | Val Leu Asp Ala His | Ala |
| Ile Trp His Ile | 320 | 285 | 285 |
| Ser Thr Ile Pro Val | | His Val Leu Phe Phe | Ser |
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| Glu Pro Gly Leu Arg | Leu Leu Ala Val | Gln Arg Leu Pro Val | Gly |
| 35 | 40 | 45 | |
| Ala Ala Phe Cys Arg | Ala Cys Gln Thr | Pro Asn Phe Val Arg | Gly |
| 50 | 55 | 60 | |
| Leu His Ser Glu Pro | Gly Leu Glu Glu | Arg Ala Glu Gly Thr | Val |
| 65 | 70 | 75 | |
| Asn Glu Gly Arg Pro | Glu Ser Asp Ala | Ala Asp His Thr Gly | Pro |
| 80 | 85 | 90 | |
| Lys Phe Asp Ile Asp | Met Met Val Ser | Leu Leu Arg Gln Glu | Asn |
| 95 | 100 | 105 | |
| Ala Arg Asp Ile Cys | Val Ile Gln Val | Pro Pro Glu Met Arg | Tyr |
| 110 | 115 | 120 | |
| Thr Asp Tyr Phe Val | Ile Val Ser Gly | Thr Ser Thr Arg His | Leu |
| 125 | 130 | 135 | |
| His Ala Met Ala Phe | Tyr Val Val Lys | Met Tyr Lys His Leu | Lys |
| 140 | 145 | 150 | |
| Cys Lys Arg Asp Pro | His Val Lys Ile | Glu Gly Lys Asp Thr | Asp |
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| Asp Trp Leu Cys Val | Asp Phe Gly Ser | Met Val Ile His Leu | Met |
| 170 | 175 | 180 | |
| Leu Pro Glu Thr Arg | Glu Ile Tyr Glu | Leu Glu Lys Leu Trp | Thr |
| 185 | 190 | 195 | |
| Leu Arg Ser Tyr Asp | Asp Gln Leu Ala | Gln Ile Ala Pro Glu | Thr |
| 200 | 205 | 210 | |
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 35 40 45
 Gln Arg Leu Arg Gly Leu Leu Leu Leu Leu Leu Gln Leu Pro
 50 55 60
 Ala Pro Ser Ser Ala Ser Glu Ile Pro Lys Gly Lys Gln Lys Ala
 65 70 75
 Gln Leu Arg Gln Arg Glu Val Val Asp Leu Tyr Asn Gly Met Cys
 80 85 90
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 95 100 105
 Ala Asn Gly Ile Pro Gly Thr Pro Gly Ile Pro Gly Arg Asp Gly
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 Phe Lys Gly Glu Lys Gly Glu Cys Leu Arg Glu Ser Phe Glu Glu
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 Tyr Gly Ile Asp Leu Gly Lys Ile Ala Glu Cys Thr Phe Thr Lys
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 215 220 225
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 230 235 240
 Ala Gly Leu Val Asp Val Ala Ile Trp Val Gly Thr Cys Ser Asp
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| | | | | | |
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| | 35 | | 40 | | 45 |
| Leu Thr Leu Leu Pro | Pro Ser Phe Pro Leu | Pro His Pro Thr Leu | | | |
| | 50 | | 55 | | 60 |
| Gly Pro Arg Arg His | Ala Ser Leu Thr Gln | Leu Gly Pro Ala Phe | | | |
| | 65 | | 70 | | 75 |
| Trp Met Ala Trp Gly | Arg Pro Trp Ala His | Leu Gly Pro Gly Gln | | | |
| | 80 | | 85 | | 90 |
| Pro Leu Gly Gln Leu | Trp Lys Ser Ser Val | Glu Glu His Leu Leu | | | |
| | 95 | | 100 | | 105 |
| Ala Ala Trp Leu Gln | Pro Leu Ala Leu Leu | Glu Trp Ser Leu Gly | | | |
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| Ala Leu Val Phe Ala | Gly Gly Ile Gly Gln | Ala Gln Phe Ser His | |
| | 35 | 40 | 45 |
| Met Gly Ala Ser Met | His Leu Arg Thr Pro | Phe Thr Tyr Arg Val | |
| | 50 | 55 | 60 |
| Pro Glu Asp Thr Trp | Gly Cys Phe Phe Val | Cys Asn Leu Leu Tyr | |
| | 65 | 70 | 75 |
| Ala Leu Gly Pro His | Leu Leu Ala Tyr Arg | Cys Leu Gln Trp Pro | |
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| | 20 | 25 | 30 |
| Arg Ala Gly Thr Gly | Ala Arg Gly Ala Gly | Ala Glu Gly Arg Glu | |
| | 35 | 40 | 45 |
| Gly Glu Ala Cys Gly | Thr Val Gly Leu Leu | Leu Glu His Ser Phe | |
| | 50 | 55 | 60 |
| Glu Ile Asp Asp Ser | Ala Asn Phe Arg Lys | Arg Gly Ser Leu Leu | |
| | 65 | 70 | 75 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Trp | Asn | Gln | Gln | Asp | Gly | Thr | Leu | Ser | Leu | Ser | Gln | Arg | Gln | Leu | |
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| Ser | Glu | Glu | Glu | Arg | Gly | Arg | Leu | Arg | Asp | Val | Ala | Ala | Leu | Asn | |
| | | | | 95 | | | | | 100 | | | | | 105 | |
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| Gly | Leu | Glu | Ala | Gly | Gly | Tyr | Val | Ser | Ser | Phe | Val | Pro | Ala | Cys | |
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| | | | | 170 | | | | | 175 | | | | | 180 | |
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| Pro | Glu | Thr | Ala | Ala | Phe | Ile | Glu | Arg | Leu | Glu | Met | Glu | Gln | Ala | |
| | | | | 200 | | | | | 205 | | | | | 210 | |
| Gln | Lys | Ala | Lys | Asn | Pro | Gln | Glu | Gln | Lys | Ser | Phe | Phe | Ala | Lys | |
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| Tyr | Trp | Met | Tyr | Ile | Ile | Pro | Val | Val | Leu | Phe | Leu | Met | Met | Ser | |
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| | | | | 35 | | | | | 40 | | | | | 45 | |
| Glu | Lys | Asp | Ser | Asn | Ser | Ser | Ser | Gly | Ser | Phe | Asn | Gly | Asn | Ser | |
| | | | | 50 | | | | | 55 | | | | | 60 | |
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| Cys | Gly | Arg | Phe | Thr | Ala | Ala | Glu | Leu | Leu | Ser | Phe | Ser | Leu | Ser | |
| | | | | 140 | | | | | 145 | | | | | 150 | |
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| Met | Asp | Ala | Leu | Ala | Met | Gly | Leu | Cys | Val | Ala | Met | Ile | Ala | Phe | |
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| | | | | 185 | | | | | 190 | | | | | 195 | |
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| Leu | Cys | Lys | Ser | Tyr | Phe | Pro | Tyr | Leu | Met | Ala | Val | Leu | Thr | Pro |
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| Lys | Ser | Asn | Arg | Lys | Met | Glu | Ser | Lys | Lys | Arg | Glu | Leu | Phe | Ser |
| | | | | 50 | | | | | 55 | | | | | 60 |
| Gln | Ile | Lys | Gly | Leu | Thr | Gly | Ala | Ser | Gly | Lys | Val | Ala | Leu | Leu |
| | | | | 65 | | | | | 70 | | | | | 75 |
| Glu | Leu | Gly | Cys | Gly | Thr | Gly | Ala | Asn | Phe | Gln | Phe | Tyr | Pro | Pro |
| | | | | 80 | | | | | 85 | | | | | 90 |
| Gly | Cys | Arg | Val | Thr | Cys | Leu | Asp | Pro | Asn | Pro | His | Phe | Glu | Lys |
| | | | | 95 | | | | | 100 | | | | | 105 |
| Phe | Leu | Thr | Lys | Ser | Met | Ala | Glu | Asn | Arg | His | Leu | Gln | Tyr | Glu |
| | | | | 110 | | | | | 115 | | | | | 120 |
| Arg | Phe | Val | Val | Ala | Pro | Gly | Glu | Asp | Met | Arg | Gln | Leu | Ala | Asp |
| | | | | 125 | | | | | 130 | | | | | 135 |
| Gly | Ser | Met | Asp | Val | Val | Val | Cys | Thr | Leu | Val | Leu | Cys | Ser | Val |
| | | | | 140 | | | | | 145 | | | | | 150 |
| Gln | Ser | Pro | Arg | Lys | Val | Leu | Gln | Glu | Val | Arg | Arg | Val | Leu | Arg |
| | | | | 155 | | | | | 160 | | | | | 165 |
| Pro | Gly | Gly | Val | Leu | Phe | Phe | Trp | Glu | His | Val | Ala | Glu | Pro | Tyr |
| | | | | 170 | | | | | 175 | | | | | 180 |
| Gly | Ser | Trp | Ala | Phe | Met | Trp | Gln | Gln | Val | Phe | Glu | Pro | Thr | Trp |
| | | | | 185 | | | | | 190 | | | | | 195 |
| Lys | His | Ile | Gly | Asp | Gly | Cys | Cys | Leu | Thr | Arg | Glu | Thr | Trp | Lys |
| | | | | 200 | | | | | 205 | | | | | 210 |

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Leu | Glu | Asn | Ala | Gln | Phe | Ser | Glu | Ile | Gln | Met | Glu | Arg | Gln |
| | | | | 215 | | | | | 220 | | | | | 225 |
| Pro | Pro | Pro | Leu | Lys | Trp | Leu | Pro | Val | Gly | Pro | His | Ile | Met | Gly |
| | | | | 230 | | | | | 235 | | | | | 240 |
| Lys | Ala | Val | Lys | | | | | | | | | | | |

<210> 11

<211> 326

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 2169991CD1

<400> 11

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Arg | Thr | Glu | Ala | Gln | Val | Pro | Ala | Leu | Gln | Pro | Pro | Glu | Pro |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |
| Gly | Leu | Glu | Gly | Ala | Met | Gly | His | Arg | Thr | Leu | Val | Leu | Pro | Trp |
| | | | | 20 | | | | | 25 | | | | | 30 |
| Val | Leu | Leu | Thr | Leu | Cys | Val | Thr | Ala | Gly | Thr | Pro | Glu | Val | Trp |
| | | | | 35 | | | | | 40 | | | | | 45 |
| Val | Gln | Val | Arg | Met | Glu | Ala | Thr | Glu | Leu | Ser | Ser | Phe | Thr | Ile |
| | | | | 50 | | | | | 55 | | | | | 60 |
| Arg | Cys | Gly | Phe | Leu | Gly | Ser | Gly | Ser | Ile | Ser | Leu | Val | Thr | Val |
| | | | | 65 | | | | | 70 | | | | | 75 |
| Ser | Trp | Gly | Gly | Pro | Asn | Gly | Ala | Gly | Gly | Thr | Thr | Leu | Ala | Val |
| | | | | 80 | | | | | 85 | | | | | 90 |
| Leu | His | Pro | Glu | Arg | Gly | Ile | Arg | Gln | Trp | Ala | Pro | Ala | Arg | Gln |
| | | | | 95 | | | | | 100 | | | | | 105 |
| Ala | Arg | Trp | Glu | Thr | Gln | Ser | Ser | Ile | Ser | Leu | Ile | Leu | Glu | Gly |
| | | | | 110 | | | | | 115 | | | | | 120 |
| Ser | Gly | Ala | Ser | Ser | Pro | Cys | Ala | Asn | Thr | Thr | Phe | Cys | Cys | Lys |
| | | | | 125 | | | | | 130 | | | | | 135 |
| Phe | Ala | Ser | Phe | Pro | Glu | Gly | Ser | Trp | Glu | Ala | Cys | Gly | Ser | Leu |
| | | | | 140 | | | | | 145 | | | | | 150 |
| Pro | Pro | Ser | Ser | Asp | Pro | Gly | Leu | Ser | Ala | Pro | Pro | Thr | Pro | Ala |
| | | | | 155 | | | | | 160 | | | | | 165 |
| Pro | Ile | Leu | Arg | Ala | Asp | Leu | Ala | Gly | Ile | Leu | Gly | Val | Ser | Gly |
| | | | | 170 | | | | | 175 | | | | | 180 |
| Val | Leu | Leu | Phe | Gly | Cys | Val | Tyr | Leu | Leu | His | Leu | Leu | Arg | Arg |
| | | | | 185 | | | | | 190 | | | | | 195 |
| His | Lys | His | Arg | Pro | Ala | Pro | Arg | Leu | Gln | Pro | Ser | Arg | Thr | Ser |
| | | | | 200 | | | | | 205 | | | | | 210 |
| Pro | Gln | Ala | Pro | Arg | Ala | Arg | Ala | Trp | Ala | Pro | Ser | Gln | Ala | Ser |
| | | | | 215 | | | | | 220 | | | | | 225 |
| Gln | Ala | Ala | Leu | His | Val | Pro | Tyr | Ala | Thr | Ile | Asn | Thr | Ser | Cys |
| | | | | 230 | | | | | 235 | | | | | 240 |
| Arg | Pro | Ala | Thr | Leu | Asp | Thr | Ala | His | Pro | His | Gly | Gly | Pro | Ser |
| | | | | 245 | | | | | 250 | | | | | 255 |
| Trp | Trp | Ala | Ser | Leu | Pro | Thr | His | Ala | Ala | His | Arg | Pro | Gln | Gly |
| | | | | 260 | | | | | 265 | | | | | 270 |
| Pro | Ala | Ala | Trp | Ala | Ser | Thr | Pro | Ile | Pro | Ala | Arg | Gly | Ser | Phe |
| | | | | 275 | | | | | 280 | | | | | 285 |
| Val | Ser | Val | Glu | Asn | Gly | Leu | Tyr | Ala | Gln | Ala | Gly | Glu | Arg | Pro |
| | | | | 290 | | | | | 295 | | | | | 300 |
| Pro | His | Thr | Gly | Pro | Gly | Leu | Thr | Leu | Phe | Pro | Asp | Pro | Arg | Gly |
| | | | | 305 | | | | | 310 | | | | | 315 |
| Pro | Arg | Ala | Met | Glu | Gly | Pro | Leu | Gly | Val | Arg | | | | |
| | | | | 320 | | | | | 325 | | | | | |

<210> 12
 <211> 105
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 2616827CD1

<400> 12
 Met Asn Leu Gly Val Ser Met Leu Arg Ile Leu Phe Leu Leu Asp
 1 5 10 15
 Val Gly Gly Ala Gln Val Leu Ala Thr Gly Lys Thr Pro Gly Ala
 20 25 30
 Glu Ile Asp Phe Lys Tyr Ala Leu Ile Gly Thr Ala Val Gly Val
 35 40 45
 Ala Ile Ser Ala Gly Phe Leu Ala Leu Lys Ile Cys Met Ile Arg
 50 55 60
 Arg His Leu Phe Asp Asp Asp Ser Ser Asp Leu Lys Ser Thr Pro
 65 70 75
 Gly Gly Leu Ser Asp Thr Ile Pro Leu Lys Lys Arg Ala Pro Arg
 80 85 90
 Arg Asn His Asn Phe Ser Lys Arg Asp Ala Gln Val Ile Glu Leu
 95 100 105

<210> 13
 <211> 626
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 2991370CD1

<400> 13
 Met Ala Pro Ser Ala Asp Pro Gly Met Ser Arg Met Leu Pro Phe
 1 5 10 15
 Leu Leu Leu Leu Trp Phe Leu Pro Ile Thr Glu Gly Ser Gln Arg
 20 25 30
 Ala Glu Pro Met Phe Thr Ala Val Thr Asn Ser Val Leu Pro Pro
 35 40 45
 Asp Tyr Asp Ser Asn Pro Thr Gln Leu Asn Tyr Gly Val Ala Val
 50 55 60
 Thr Asp Val Asp His Asp Gly Asp Phe Glu Ile Val Val Ala Gly
 65 70 75
 Tyr Asn Gly Pro Asn Leu Val Leu Lys Tyr Asp Arg Ala Gln Lys
 80 85 90
 Arg Leu Val Asn Ile Ala Val Asp Glu Arg Ser Ser Pro Tyr Tyr
 95 100 105
 Ala Leu Arg Asp Arg Gln Gly Asn Ala Ile Gly Val Thr Ala Cys
 110 115 120
 Asp Ile Asp Gly Asp Gly Arg Glu Glu Ile Tyr Phe Leu Asn Thr
 125 130 135
 Asn Asn Ala Phe Ser Gly Val Ala Thr Tyr Thr Asp Lys Leu Phe
 140 145 150
 Lys Phe Arg Asn Asn Arg Trp Glu Asp Ile Leu Ser Asp Glu Val
 155 160 165
 Asn Val Ala Arg Gly Val Ala Ser Leu Phe Ala Gly Arg Ser Val
 170 175 180
 Ala Cys Val Asp Arg Lys Gly Ser Gly Arg Tyr Ser Ile Tyr Ile
 185 190 195
 Ala Asn Tyr Ala Tyr Gly Asn Val Gly Pro Asp Ala Leu Ile Glu
 200 205 210
 Met Asp Pro Glu Ala Ser Asp Leu Ser Arg Gly Ile Leu Ala Leu

| | | | | | |
|-----------------|-----|---------------------|-----|---------------------|-----|
| Arg Asp Val Ala | 215 | Ala Glu Ala Gly Val | 220 | Ser Lys Tyr Thr Gly | 225 |
| Arg Gly Val Ser | 230 | Val Gly Pro Ile Leu | 235 | Ser Ser Ala Ser | 240 |
| Ile Phe Cys Asp | 245 | Asn Glu Asn Gly Pro | 250 | Asn Phe Leu Phe His | 255 |
| Arg Gly Asp Gly | 260 | Thr Phe Val Asp Ala | 265 | Ala Ser Ala Gly | 270 |
| Asp Asp Pro His | 275 | Gln His Gly Arg Gly | 280 | Val Ala Leu Ala Asp | 285 |
| Asn Arg Asp Gly | 290 | Lys Val Asp Ile Val | 295 | Gly Asn Trp Asn | 300 |
| Pro His Arg Leu | 305 | Tyr Leu Gln Met Ser | 310 | Thr His Gly Lys Val | 315 |
| Phe Arg Asp Ile | 320 | Ala Ser Pro Lys Phe | 325 | Ser Met Pro Ser Pro | 330 |
| Arg Thr Val Ile | 335 | Thr Ala Asp Phe Asp | 340 | Asn Asp Gln Glu Leu | 345 |
| Ile Phe Phe Asn | 350 | Asn Ile Ala Tyr Arg | 355 | Ser Ser Ser Ala Asn | 360 |
| Leu Phe Arg Val | 365 | Ile Arg Arg Glu His | 370 | Gly Asp Pro Leu Ile | 375 |
| Glu Leu Asn Pro | 380 | Gly Asp Ala Leu Glu | 385 | Pro Glu Gly Arg Gly | 390 |
| Gly Gly Val Val | 395 | Thr Asp Phe Asp Gly | 400 | Asp Gly Met Leu Asp | 405 |
| Ile Leu Ser His | 410 | Gly Glu Ser Met Ala | 415 | Gln Pro Leu Ser Val | 420 |
| Arg Gly Asn Gln | 425 | Gly Phe Asn Asn Asn | 430 | Trp Leu Arg Val Val | 435 |
| Arg Thr Arg Phe | 440 | Gly Ala Phe Ala Arg | 445 | Gly Ala Lys Val Val | 450 |
| Tyr Thr Lys Lys | 455 | Ser Gly Ala His Leu | 460 | Arg Ile Ile Asp Gly | 465 |
| Ser Gly Tyr Leu | 470 | Cys Glu Met Glu Pro | 475 | Val Ala His Phe Gly | 480 |
| Gly Lys Asp Glu | 485 | Ala Ser Ser Val Glu | 490 | Val Thr Trp Pro Asp | 495 |
| Lys Met Val Ser | 500 | Arg Asn Val Ala Ser | 505 | Gly Glu Met Asn Ser | 510 |
| Leu Glu Ile Leu | 515 | Pro Arg Asp Glu Asp | 520 | Thr Leu Gln Asp | 525 |
| Ala Pro Leu Glu | 530 | Cys Gly Gln Gly Phe | 535 | Ser Gln Gln Glu Asn | 540 |
| His Cys Met Asp | 545 | Thr Asn Glu Cys Ile | 550 | Gln Phe Pro Phe Val | 555 |
| Pro Arg Asp Lys | 560 | Pro Val Cys Val Asn | 565 | Thr Tyr Gly Ser Tyr | 570 |
| Cys Arg Thr Asn | 575 | Lys Lys Cys Ser Arg | 580 | Gly Tyr Glu Pro Asn | 585 |
| Asp Gly Thr Ala | 590 | Cys Val Gly Trp Trp | 595 | Ser Pro Val Leu Lys | 600 |
| Val Thr Pro Gln | 605 | Val Gly Lys Ser Leu | 610 | Gly Pro | 615 |
| | 620 | | 625 | | |

<210> 14

<211> 296

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3031062CD1

<400> 14

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Met Glu Trp Trp Ala Ser Ser Pro Leu Arg Leu Trp Leu Leu Leu
 1          5          10          15
Phe Leu Leu Pro Ser Ala Gln Gly Arg Gln Lys Glu Ser Gly Ser
          20          25          30
Lys Trp Lys Val Phe Ile Asp Gln Ile Asn Arg Ser Leu Glu Asn
          35          40          45
Tyr Glu Pro Cys Ser Ser Gln Asn Cys Ser Cys Tyr His Gly Val
          50          55          60
Ile Glu Glu Asp Leu Thr Pro Phe Arg Gly Gly Ile Ser Arg Lys
          65          70          75
Met Met Ala Glu Val Val Arg Arg Lys Leu Gly Thr His Tyr Gln
          80          85          90
Ile Thr Lys Asn Arg Leu Tyr Arg Glu Asn Asp Cys Met Phe Pro
          95          100          105
Ser Arg Cys Ser Gly Val Glu His Phe Ile Leu Glu Val Ile Gly
          110          115          120
Arg Leu Pro Asp Met Glu Met Val Ile Asn Val Arg Asp Tyr Pro
          125          130          135
Gln Val Pro Lys Trp Met Glu Pro Ala Ile Pro Val Phe Ser Phe
          140          145          150
Ser Lys Thr Ser Glu Tyr His Asp Ile Met Tyr Pro Ala Trp Thr
          155          160          165
Phe Trp Glu Gly Gly Pro Ala Val Trp Pro Ile Tyr Pro Thr Gly
          170          175          180
Leu Gly Arg Trp Asp Leu Phe Arg Glu Asp Leu Val Arg Ser Ala
          185          190          195
Ala Gln Trp Pro Trp Lys Lys Lys Asn Ser Thr Ala Tyr Phe Arg
          200          205          210
Gly Ser Arg Thr Ser Pro Glu Arg Asp Pro Leu Ile Leu Leu Ser
          215          220          225
Arg Lys Asn Pro Lys Leu Val Asp Ala Glu Tyr Thr Lys Asn Gln
          230          235          240
Ala Trp Lys Ser Met Lys Asp Thr Leu Gly Lys Pro Ala Ala Lys
          245          250          255
Asp Val His Leu Val Asp His Cys Lys Tyr Lys Tyr Leu Phe Asn
          260          265          270
Phe Arg Gly Val Leu Gln Val Ser Gly Leu Asn Thr Ser Ser Cys
          275          280          285
Val Ala Ile Ile Leu Met Arg Lys Arg Thr Tyr
          290          295

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<210> 15

<211> 249

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3101617CD1

<400> 15

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Met Asp Gly Lys Lys Cys Ser Val Trp Met Phe Leu Pro Leu Val
 1          5          10          15
Phe Thr Leu Phe Thr Ser Ala Gly Leu Trp Ile Val Tyr Phe Ile
          20          25          30
Ala Val Glu Asp Asp Lys Ile Leu Pro Leu Asn Ser Ala Glu Arg
          35          40          45
Lys Pro Gly Val Lys His Ala Pro Tyr Ile Ser Ile Ala Gly Asp
          50          55          60
Asp Pro Pro Ala Ser Cys Val Phe Ser Gln Val Met Asn Met Ala
          65          70          75
Ala Phe Leu Ala Leu Val Val Ala Val Leu Arg Phe Ile Gln Leu
          80          85          90

```

```

Lys Pro Lys Val Leu Asn Pro Trp Leu Asn Ile Ser Gly Leu Val
    95      100      105
Ala Leu Cys Leu Ala Ser Phe Gly Met Thr Leu Leu Gly Asn Phe
    110      115      120
Gln Leu Thr Asn Asp Glu Glu Ile His Asn Val Gly Thr Ser Leu
    125      130      135
Thr Phe Gly Phe Gly Thr Leu Thr Cys Trp Ile Gln Ala Ala Leu
    140      145      150
Thr Leu Lys Val Asn Ile Lys Asn Glu Gly Arg Arg Val Gly Ile
    155      160      165
Pro Arg Val Ile Leu Ser Ala Ser Ile Thr Leu Cys Val Val Leu
    170      175      180
Tyr Phe Ile Leu Met Ala Gln Ser Ile His Met Tyr Ala Ala Arg
    185      190      195
Val Gln Trp Gly Leu Val Met Cys Phe Leu Ser Tyr Phe Gly Thr
    200      205      210
Phe Ala Val Glu Phe Arg His Tyr Arg Tyr Glu Ile Val Cys Ser
    215      220      225
Glu Tyr Gln Glu Asn Phe Leu Ser Phe Ser Glu Ser Leu Ser Glu
    230      235      240
Ala Ser Glu Tyr Gln Thr Asp Gln Val
    245

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<210> 16
 <211> 124
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3216178CD1

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<400> 16
Met Gly Gly Tyr Leu Lys Thr Arg Pro Trp Thr Leu Gln His Phe
  1      5      10      15
Tyr Leu Cys Leu Met Pro Ala Ala Thr Trp Leu Val Leu Leu Leu
    20      25      30
Leu Leu Trp Leu Ser Leu Gly Val Lys Thr Gly Ser Cys Ser Gln
    35      40      45
Pro Gln Asn Leu Cys Cys Leu Gly Thr Asp His His Cys Lys Arg
    50      55      60
Gly Ser Cys Tyr Cys Asp Glu Phe Cys His Val Ala Pro Asp Cys
    65      70      75
His Pro Asp His Ser Val Leu Cys Asn Pro Ala Ser Gln Met Thr
    80      85      90
Lys Met Val Leu Gln Met Val Leu Arg Met Glu Asn Pro Pro Ser
    95      100      105
Pro Ala Arg Ser His Leu Asp Trp Met Gln Ser Met Val Ser Ser
    110      115      120
Leu Gln Val Leu

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<210> 17
 <211> 101
 <212> PRT
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3406803CD1

<400> 17

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Pro | Val | Gly | Ala | Gln | Pro | Arg | Ser | Pro | Pro | Trp | Val | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |
| Ala | Arg | Leu | Leu | His | Pro | Arg | Gly | Pro | Ala | Ala | Thr | Ser | Leu | Val |
| | | | | 20 | | | | | 25 | | | | | 30 |
| Pro | Phe | Leu | Pro | Trp | Gly | Ser | Leu | Glu | Ser | His | Thr | Pro | Cys | Pro |
| | | | | 35 | | | | | 40 | | | | | 45 |
| Tyr | Arg | Ala | Cys | Ser | Pro | Gly | Trp | Glu | Leu | Thr | Leu | Ser | Thr | Phe |
| | | | | 50 | | | | | 55 | | | | | 60 |
| Pro | Glu | Arg | Glu | Thr | Leu | Ser | Gly | Gly | Glu | Val | Arg | Lys | Arg | Gly |
| | | | | 65 | | | | | 70 | | | | | 75 |
| Ala | Gly | Ser | Met | Val | Gly | Gly | Gly | Glu | Ser | Thr | Met | Thr | Arg | Ala |
| | | | | 80 | | | | | 85 | | | | | 90 |
| Leu | Cys | Val | Arg | Leu | Leu | Thr | Lys | Leu | Arg | Val | | | | |
| | | | | 95 | | | | | 100 | | | | | |

<210> 18

<211> 540

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3468066CD1

<400> 18

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Thr | Ser | Gly | Ala | Ala | Ser | Ala | Glu | Leu | Val | Ile | Gly | Trp |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |
| Cys | Ile | Phe | Gly | Leu | Leu | Leu | Leu | Ala | Ile | Leu | Ala | Phe | Cys | Trp |
| | | | | 20 | | | | | 25 | | | | | 30 |
| Ile | Tyr | Val | Arg | Lys | Tyr | Gln | Ser | Arg | Arg | Glu | Ser | Glu | Val | Val |
| | | | | 35 | | | | | 40 | | | | | 45 |
| Ser | Thr | Ile | Thr | Ala | Ile | Phe | Ser | Leu | Ala | Ile | Ala | Leu | Ile | Thr |
| | | | | 50 | | | | | 55 | | | | | 60 |
| Ser | Ala | Leu | Leu | Pro | Val | Asp | Ile | Phe | Leu | Val | Ser | Tyr | Met | Lys |
| | | | | 65 | | | | | 70 | | | | | 75 |
| Asn | Gln | Asn | Gly | Thr | Phe | Lys | Asp | Trp | Ala | Asn | Ala | Asn | Val | Ser |
| | | | | 80 | | | | | 85 | | | | | 90 |
| Arg | Gln | Ile | Glu | Asp | Thr | Val | Leu | Tyr | Gly | Tyr | Tyr | Thr | Leu | Tyr |
| | | | | 95 | | | | | 100 | | | | | 105 |
| Ser | Val | Ile | Leu | Phe | Cys | Val | Phe | Phe | Trp | Ile | Pro | Phe | Val | Tyr |
| | | | | 110 | | | | | 115 | | | | | 120 |
| Phe | Tyr | Tyr | Glu | Glu | Lys | Asp | Asp | Asp | Asp | Thr | Ser | Lys | Cys | Thr |
| | | | | 125 | | | | | 130 | | | | | 135 |
| Gln | Ile | Lys | Thr | Ala | Leu | Lys | Tyr | Thr | Leu | Gly | Phe | Val | Val | Ile |
| | | | | 140 | | | | | 145 | | | | | 150 |
| Cys | Ala | Leu | Leu | Leu | Leu | Val | Gly | Ala | Phe | Val | Pro | Leu | Asn | Val |
| | | | | 155 | | | | | 160 | | | | | 165 |
| Pro | Asn | Asn | Lys | Asn | Ser | Thr | Glu | Trp | Glu | Lys | Val | Lys | Ser | Leu |
| | | | | 170 | | | | | 175 | | | | | 180 |
| Phe | Glu | Glu | Leu | Gly | Ser | Ser | His | Gly | Leu | Ala | Ala | Leu | Ser | Phe |
| | | | | 185 | | | | | 190 | | | | | 195 |
| Ser | Ile | Ser | Ser | Leu | Thr | Leu | Ile | Gly | Met | Leu | Ala | Ala | Ile | Thr |
| | | | | 200 | | | | | 205 | | | | | 210 |
| Tyr | Thr | Ala | Tyr | Gly | Met | Ser | Ala | Leu | Pro | Leu | Asn | Leu | Ile | Lys |
| | | | | 215 | | | | | 220 | | | | | 225 |
| Gly | Thr | Arg | Ser | Ala | Ala | Tyr | Glu | Arg | Leu | Glu | Asn | Thr | Glu | Asp |
| | | | | 230 | | | | | 235 | | | | | 240 |
| Ile | Glu | Glu | Val | Glu | Gln | His | Ile | Gln | Thr | Ile | Lys | Ser | Lys | Ser |
| | | | | 245 | | | | | 250 | | | | | 255 |
| Lys | Asp | Gly | Arg | Pro | Leu | Pro | Ala | Arg | Asp | Lys | Arg | Ala | Leu | Lys |
| | | | | 260 | | | | | 265 | | | | | 270 |
| Gln | Phe | Glu | Glu | Arg | Leu | Arg | Thr | Leu | Lys | Lys | Arg | Glu | Arg | His |
| | | | | 275 | | | | | 280 | | | | | 285 |
| Leu | Glu | Phe | Ile | Glu | Asn | Ser | Trp | Trp | Thr | Lys | Phe | Cys | Gly | Ala |

| | | | | | |
|-----------------|---------------------|-------------------------|-----|-----|-----|
| Leu Arg Pro Leu | Lys Ile Val Trp Gly | Ile Phe Phe Ile Leu Val | 290 | 295 | 300 |
| Ala Leu Leu Phe | Val Ile Ser Leu Phe | Leu Ser Asn Leu Asp Lys | 305 | 310 | 315 |
| Ala Leu His Ser | Ala Gly Ile Asp Ser | Gly Phe Ile Ile Phe Gly | 320 | 325 | 330 |
| Ala Asn Leu Ser | Asn Pro Leu Asn Met | Leu Leu Pro Leu Leu Gln | 335 | 340 | 345 |
| Thr Val Phe Pro | Leu Asp Tyr Ile Leu | Ile Thr Ile Ile Ile Met | 350 | 355 | 360 |
| Tyr Phe Ile Phe | Thr Ser Met Ala Gly | Ile Arg Asn Ile Gly Ile | 365 | 370 | 375 |
| Trp Phe Phe Trp | Ile Arg Leu Tyr Lys | Ile Arg Arg Gly Arg Thr | 380 | 385 | 390 |
| Arg Pro Gln Ala | Leu Leu Phe Leu Cys | Met Ile Leu Leu Leu Ile | 395 | 400 | 405 |
| Val Leu His Thr | Ser Tyr Met Ile Tyr | Ser Leu Ala Pro Gln Tyr | 410 | 415 | 420 |
| Val Met Tyr Gly | Ser Gln Asn Tyr Leu | Ile Glu Thr Asn Ile Thr | 425 | 430 | 435 |
| Ser Asp Asn His | Lys Gly Asn Ser Thr | Leu Ser Val Pro Lys Arg | 440 | 445 | 450 |
| Cys Asp Ala Glu | Ala Pro Glu Asp Gln | Cys Thr Val Thr Arg Thr | 455 | 460 | 465 |
| Tyr Leu Phe Leu | His Lys Phe Trp Phe | Phe Ser Ala Ala Tyr Tyr | 470 | 475 | 480 |
| Phe Gly Asn Trp | Ala Phe Leu Gly Val | Phe Leu Ile Gly Leu Ile | 485 | 490 | 495 |
| Val Ser Cys Cys | Lys Gly Lys Lys Ser | Val Ile Glu Gly Val Asp | 500 | 505 | 510 |
| Glu Asp Ser Asp | Ile Ser Asp Asp Glu | Pro Ser Val Tyr Ser Ala | 515 | 520 | 525 |
| | 530 | 535 | | | 540 |

<210> 19

<211> 108

<212> PRT

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3592862CD1

<400> 19

| | | | | | |
|---------------------|---|-----|-----|----|----|
| Met Thr Pro Ser Arg | Leu Pro Trp Leu Leu Ser Trp Val Ser Ala | 1 | 5 | 10 | 15 |
| Thr Ala Trp Arg Ala | Ala Arg Ser Pro Leu Leu Cys His Ser Leu | 20 | 25 | 30 | 35 |
| Arg Lys Thr Ser Ser | Ser Gln Gly Gly Lys Ser Glu Leu Val Lys | 40 | 45 | 50 | 55 |
| Gln Ser Leu Lys Lys | Pro Lys Leu Pro Glu Gly Arg Phe Asp Ala | 60 | 65 | 70 | 75 |
| Pro Glu Asp Ser His | Leu Glu Lys Glu Pro Leu Glu Lys Phe Pro | 80 | 85 | 90 | 95 |
| Asp Asp Val Asn Pro | Val Thr Lys Glu Lys Gly Gly Pro Arg Gly | 100 | 105 | | |
| Pro Glu Pro Thr Arg | Tyr Gly Asp Trp Glu Arg Lys Gly Arg Cys | | | | |
| Ile Asp Phe | | | | | |

<210> 20

<211> 114
 <212> PRT
 <213> Homo sapiens
 <220>
 <221> misc_feature
 <223> Incyte ID No: 3669422CD1

<400> 20
 Met Ser Ser Ser Ser Ser Arg Cys Leu Ser Pro Ser Pro Gly Met
 1 5 10 15
 Ser Leu Trp Ser Cys Leu Leu Phe Leu Cys Thr Pro Ser Pro Thr
 20 25 30
 Thr Thr Ser Pro Ser Pro Asp Pro Ser Gln Val Ser Thr Leu Pro
 35 40 45
 Thr Pro Ser Pro Gln Arg Glu Gly Leu Lys Gln Gly Gln Trp Arg
 50 55 60
 Lys Thr Gly Pro Ser Ser Thr His Pro His Thr Pro Ser Ser Arg
 65 70 75
 Pro Pro Ser Pro Ser Ser Leu Pro Leu Thr Trp Lys Leu Leu Gln
 80 85 90
 Pro Ile Pro Ser His Ser Leu Pro His Pro Pro Lys Ile His Thr
 95 100 105
 Gly Pro Ser Leu Ala Glu Cys Gly His
 110

<210> 21
 <211> 114
 <212> PRT
 <213> Homo sapiens
 <220>
 <221> misc_feature
 <223> Incyte ID No: 3688740CD1

<400> 21
 Met Arg Gly Glu His Asn Ser Thr Ser Tyr Asp Ser Ala Val Ile
 1 5 10 15
 Tyr Arg Gly Phe Trp Ala Val Leu Met Leu Leu Gly Val Val Ala
 20 25 30
 Val Val Ile Ala Ser Phe Leu Ile Ile Cys Ala Ala Pro Phe Ala
 35 40 45
 Ser His Phe Leu Tyr Lys Ala Gly Gly Ser Tyr Ile Ala Ala
 50 55 60
 Asp Gly Ile Ser Ser Leu Cys Tyr Ser Ser Leu Ser Lys Ser Leu
 65 70 75
 Leu Ser Gln Pro Leu Arg Glu Thr Ser Ser Ala Ile Asn Asp Ile
 80 85 90
 Ser Leu Leu Gln Ala Leu Met Pro Leu Leu Gly Trp Thr Ser His
 95 100 105
 Trp Thr Cys Ile Thr Val Gly Leu Tyr
 110

<210> 22
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<400> 22

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Lys Glu Glu Thr Arg Ser Ser Ala Ala Ala Ala Ala Asp Thr Gln
 125      130      135
Asp Glu Ala Thr Gly Ala Glu Glu Glu Leu Leu Pro Gly Val Asp
 140      145      150
Val Leu Leu Glu Val Phe Pro Thr Cys Ser Val Glu Gln Ala Gln
 155      160      165
Trp Val Leu Ala Lys Ala Arg Gly Asp Leu Glu Glu Ala Val Gln
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Pro Asn Gln Asp Leu Pro Arg Arg Leu Arg Gly Pro Gln Lys Asp
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<213> Homo sapiens

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<220>
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| acagatgcct | gctttgtcta | tatctaccag | tatgagccat | acctgcggga | ccctgtggcc | 180 |
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<213> Homo sapiens

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<223> Incyte ID No: 1757161CB1

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| tccacaccca | tccttgcaag | tggcagcttt | gtctctgttg | agaatggact | ctacgctcag | 1920 |
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| acagcccatg | gttaacatct | caggatgttc | tgcatcctaaa | cacccaaggc | tggtaatgaa | 420 |
| ctttcacatg | gactgaatat | tggaggcaaa | taatagaagg | aatagaatat | acagtgcctc | 480 |
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| ttactgatgt | ggaccatgat | ggggactttg | agatcgctcg | ggcggggtac | aatggaccca | 360 |
| acctggttct | gaagtatgac | cgggcccaga | agcggctggt | gaacatcgcg | gtcgatgagc | 420 |
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| cgggggtggc | cacgtacacc | gacaagttgt | tcaagttccg | caataaccgg | tggaagaca | 600 |
| tcctgagcga | tgaggtcaac | gtggcccgtg | gtgtggccag | cctctttgcc | ggacgctctg | 660 |
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tctctaagcc tcatggacaa agatgtagac caaatgcaag agctgagctt gctttgggtt 1680
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<210> 38

<211> 1306

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3216178CB1

<400> 38

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aagaaagggg ccgtagctag ggcagagctc cactgcaatg attgttttag gggtaggagc 720
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aatcaactt ttctgctcgt gagaccagg aagtcacaga tacagggcat ctttagtgaa 1140
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<210> 39
 <211> 851
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3406803CB1

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gtgtcgagac t 851

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<210> 40
 <211> 2204
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3468066CB1

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<400> 40
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gtgcagtata tctcgcgctc tctccccttt cccccccccc tttcccacc cgggcgctc 180
aggttggtct ggaccggaag cgaagatggc gacttctggc gcggcctcgg cggagctgg 240
gatcggtgg tgcatattcg gcctcttact actggctatt ttggcattct gctggatata 300
tgttcgtaaa taccaaagtc ggcgggaaag tgaagtgtc tccaccataa cagcaatttt 360
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| | | | | | | |
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| tctctgcatg | atacttctgc | ttattgtcct | tcacactagc | tacatgattt | atagtcttgc | 1500 |
| tccccaatat | gttatgtatg | gaagccaaaa | ttacttaata | gagactaata | taacttctga | 1560 |
| taatcataaa | ggcaattcaa | ccctttctgt | gccaaagaga | tgtgatgcag | aagctcctga | 1620 |
| agatcagtg | actgttacct | ggacatacct | attccttcac | aagttctgg | tcttcagtgc | 1680 |
| tgcttactat | tttggttaact | gggcctttct | tggggattt | ttgattggat | taattgtatc | 1740 |
| ctgttgtaaa | gggaagaaat | cggttattga | aggagtagat | gaagattcag | acataagtga | 1800 |
| tgatgagccc | tctgtctatt | ctgcttgaca | gccttctgtc | ttaaagggtt | tataatgctg | 1860 |
| actgaatatc | tgttatgcat | ttttaagta | ttaaactaac | attaggattt | gctaactagc | 1920 |
| tttcatcaaa | aatgggagca | tggctataag | acaactatat | tttattatat | gttttctgaa | 1980 |
| gtaacattgt | atcatagatt | aacattttta | attaccataa | tcattgctatg | taaatataag | 2040 |
| actactggct | ttgtgagggg | atgtttgtgc | aaaatttttt | cctctaattgt | ataatagtgt | 2100 |
| taaattgatt | aaaaatcttc | cagaattaat | attccctttt | gtcacttttt | gaaaacataa | 2160 |
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<210> 41
 <211> 570
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3592862CB1

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| gggtctcggc | cacggcgctg | agagcggcaa | gatcacccct | tctgtgtcat | tctctgagga | 120 |
| aaacaagttc | ttctcaagga | ggaaagtctg | aacttgtcaa | acagtccctt | aagaagccga | 180 |
| agttaccaga | aggctgtttt | gatgcaccag | aggattccca | tttagagaaa | gaaccactgg | 240 |
| aaaaatttcc | agatgatggt | aatccagtga | ccaaagaaaa | aggtggaccc | aggggcccag | 300 |
| aacctaccgc | atatggagat | tgggaacgaa | aaggacgctg | tattgatttt | taagtcgcat | 360 |
| attctttaac | ttcaatatgt | ttttctgaat | atgtacatct | gaattaactt | atttctgatt | 420 |
| attttctttc | tttatatcct | ttatgtcgtg | tagtttgtgt | aatgtgttta | aatatatata | 480 |
| tatatatata | tatatatata | tatatatata | ggggcttagg | aagaaaatat | gctgctgtaa | 540 |
| attaggaaag | ggagaccagc | ctgaccaata | | | | 570 |

<210> 42
 <211> 802
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <223> Incyte ID No: 3669422CB1

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| cttcccagg | gatgtctctg | tggagctgcc | ttttgttctt | atgcacccca | agccccacga | 180 |
| ccacatcccc | ctccccagac | cccagtcagg | tgagcacact | acccacccca | agccctcaga | 240 |
| gggagggcct | gaagcagggc | cagtggagga | aaactggccc | ttccagcacc | cacccccaca | 300 |
| ccccctcttc | ccgtcccccc | agccctcttt | cccttccctt | cacctggaag | cttcttcaac | 360 |
| caatcccttc | acactctctc | ccccatcccc | ccaagataca | cactggaccc | tctcttgctg | 420 |
| aatgtgggca | ttaatttttt | gactgcagct | ctgcttctcc | agccccgccg | tgggtggcaa | 480 |
| gctgtgttca | tacctaattt | ttctggaagg | ggacagtga | aagaggagtg | acaggaggga | 540 |
| aagggggaga | caaaaactct | actctcaacc | tcacaccaac | acctccattt | atcactctct | 600 |
| ctgcccccat | tccttcaaga | ggagaccctt | tggggacaag | gccgtttctt | tgtgaggaat | 660 |
| aaaaagggtta | gaaggggccc | cctctctgaa | ggccccactt | ccctgggatg | ctacaatcca | 720 |
| atgatggaag | atggcattag | ctacaccacc | ctgcgctttc | ccgagatgaa | cataccacga | 780 |
| actggagatg | cagatgcctc | ag | | | | 802 |

<210> 43
 <211> 693
 <212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3688740CB1

<400> 43

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tgttttaatg ttttcttctg aaatgcttta tgcctaaatg tttctgtact actcttcttt 600
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gaatgaatgg atgaaatgca tacctgctta tag 693
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<210> 44

<211> 1212

<212> DNA

<213> Homo sapiens

<220>

<221> misc_feature

<223> Incyte ID No: 3742589CB1

<400> 44

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cggctgctgc tgctgcagac acccaagatg aggcactgg cgctgaggag gagcttctgc 600
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aaaaaaaaaa aa 1212
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